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THESIS

THE PERFORMANCE AND RETENTION OF FEMALE NAVY OFFICERS WITH A MILITARY SPOUSE

by

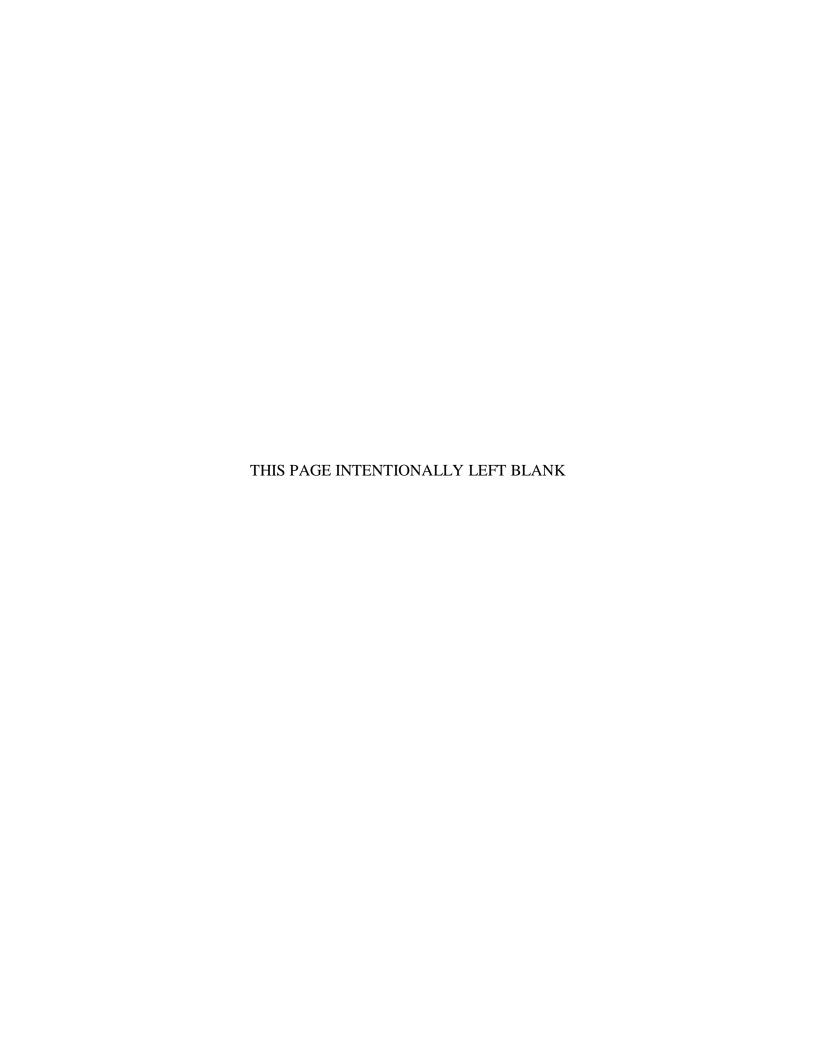Stefan Wagner

March 2017

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**THE PERFORMANCE AND RETENTION OF FEMALE NAVY OFFICERS
WITH A MILITARY SPOUSE**

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

The Military Leadership Diversity Commission (MLDC) in 2011 emphasized the importance of gender equality and diversity in the U.S. armed forces, placing gender integration and inclusion on the Navy's priority list. The retention rates of female Navy officers tend to be lower than the rates of their male counterparts. Recent studies focused on better understanding the factors that affect female retention to improve gender integration and inclusion in the Navy. With the number of dual-military couples on the rise, and with women more likely than men to be married to a service member, this study examines retention and performance of female Navy officers in a dual-military marriage. Using data on Navy officers commissioned between 1999 and 2003, results of a multivariate analysis indicate that women in a dual-military marriage tend to stay in the Navy at a lower rate than do women married to a civilian spouse. However, women in a dual-military marriage who stay beyond 10 years of service show higher performance than do their male counterparts. These findings suggest that the Navy needs to address work-life balance to increase retention rates of female Navy officers in a dual-military marriage, and subsequently benefit from their higher performance later.

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LIST OF ACRONYMS AND ABBREVIATIONS

AVF	All-Volunteer Force
CNA	Center for Naval Analyses
CWO	Chief Warrant Officer
DOD	Department of Defense
DON	Department of the Navy
DMDC	Defense Manpower Data Center
EP	Early Promotion
FITREP	Fitness Report (Military Performance Evaluation Report)
FTS	Full-time Support
FY	Fiscal Year
LDO	Limited Duty Officer
MLDC	Military Leadership Diversity Commission
MOS	Military Occupational Specialty
MSR	Minimum Service Requirement
NAVPERSCOM	Navy Personnel Command
NPS	Naval Postgraduate School
OCS	Officer Candidate School
OLS	Ordinary Least Square
OMF	Officer Master File
OPINS	Officer Personnel Information System
PM	Performance Management
RAP	Recommendation for Accelerated Promotion
RL	Restricted Line
ROTC	Reserve Officer Training Corps
SPEC	Special Operations (community)
SUB	Submarine (community)
SWO	Surface Warfare Officer
URL	Unrestricted Line
USMC	United States Marine Corps
USN	United States Navy

USNA   United States Naval Academy

YOS   Years of Service

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I.   INTRODUCTION

A.   INTRODUCTION

Individuals in our society face constant changes in their lifestyles. Every now and then, new generations of people—from the "GI Generation" to "Generation Z"—are identified based on their lifestyles and their influences (Novak, n.d.). Each of these generations shares collective experiences and similar ideals. These influences and their outcomes do not spare military personnel. Indeed, one of the emerging trends over the past few decades is a family model with both parents working. These so-called "dual-career" families have been researched broadly. For example, in a Naval Postgraduate School (NPS) thesis published nearly 35 years ago, Henderson (1981) analyzed the differences among dual-career couples and single- and dual-income families within the U.S. Coast Guard. As the number of dual-career couples in the U.S. has continued to increase in recent years, so has the number of "dual-military" couples for which both partners serve in the military (Department of Defense, 2015a). Disproportionately, more married female than married male officers are part of dual-military families, 39.2% and 5.1%, respectively (Department of Defense, 2015a). This disproportion is of particular interest with respect to female retention because it opens the door for policy intervention.

In an attempt to improve the demographic diversity of its force following the mission to "attract, develop, and retain a high-quality, diverse workforce that values a culture of inclusion" and to achieve gender integration most effectively, the U.S. Navy has been trying to recruit, train, and retain more women (Navy Personnel Command, 2016b). Recent policies have shown success; however, the Military Leadership Diversity Commission (MLDC) in 2011 still found that women were underrepresented in senior leadership positions. One of the reasons identified was female retention. Recent studies have shown that female officers are less likely than their male counterparts to stay in the Navy (Mundell, 2016). Among the many factors that explain that outcome are quality of life and work–life balance, which have become a focus in studies on personnel retention.

Quality-of-life issues also affect the labor-supply decisions of dual-military couples. More specifically, the retention behavior and job performance outcomes of female officers in such marriages could be an indicator of deficient quality of life and the need to deliver policies aimed at improving the integration and inclusion of female officers. This thesis seeks to contribute to a deeper understanding of factors affecting quality of life and examines the retention behavior and job performance of female officers in dual-military marriages, an increasing trend in the Navy officer corps.

This thesis takes a quantitative approach in comparing the retention and performance of female U.S. Navy officers in a dual-military marriage with that of their male counterparts as well as female Navy officers not in dual-military marriages (either married to civilians or single). Only heterosexual dual-military marriages are covered in this thesis as the available dataset contains only one same-sex couple. As same-sex marriage has become legal and more common in recent years, research with more recent data could address specifics of same-sex dual-military couples.

Using a regression analysis approach, this study examines Navy officer cohorts commissioned between 1999 and 2003, followed annually. The working hypothesis is that the retention and job performance of female officers in a dual-military marriage differ significantly from that of officers in the comparison groups due to additional demands the military lifestyle places on dual-military couples.

B.   RESEARCH QUESTIONS

The Navy is interested in examining the retention behavior and job performance of female officers in a dual-military marriage to better understand the factors that affect their labor-supply decisions and to incorporate this knowledge into a comprehensive manpower strategy to increase the level of gender integration and inclusion in the Navy.

The primary research question in the present study is as follows:

- How do the retention and job performance of female Navy officers in a dual-military marriage compare with the retention and job performance of other Navy officers?

The secondary research questions are as follows:

- How do the retention and job performance of female Navy officers in a dual-military marriage differ from the retention and job performance of other Navy officers by gender, marital status, Navy community, commissioning source, and other factors?

- Based on the findings, what are the implications for improving U.S. Navy manpower and personnel practices, programs, and policies, in general, as well as the efforts of gender integration and inclusion, in particular?

C.   ORGANIZATION OF STUDY

This thesis is organized into five chapters. Chapter II provides a background on dual-military couples and talent management in the U.S. Navy. Chapter III describes the available data, introduces the quantitative method, and details the models used. Chapter IV presents the results of the regression models. Finally, Chapter V provides a brief summary of the study, formulates conclusions, and offers recommendations for future policy interventions based on the findings.

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II. BACKGROUND AND LITERATURE REVIEW

A. BACKGROUND

This study examines the retention and job performance of female Navy officers in a dual-military marriage and the possible connection between work–life balance demands and their experiences as Navy officers. Dual-military couples are a subset of the Navy population that faces specific challenges regarding work–life balance and quality of life compared with other couples in which only one of the spouses is a service member. At the same time, one can assume that professional performance is somehow linked to those challenges. This chapter discusses demographic statistics to better understand the position of dual-military couples in today's Navy.

1. Talent Management, Performance Evaluation, and Productivity of Naval Officers

High-performing, highly skilled, and well-educated personnel with excellent professional perspectives are desired in the labor market as well as in the military. Representing the supply side and putting industry in the demand role, these high-quality persons likely garner many offers and career incentives in the labor market. The U.S. Navy must offer comparable incentives to compete with industry. In 2015, the Department of the Navy launched a series of talent-management initiatives (Department of the Navy, 2015). With these initiatives, the Navy expressed its intention to win the "war for talent" by identifying high-potential personnel, evaluating and predicting their performance, and establishing valuable incentives to recruit and retain them (Navy Personnel Command, 2016b).

The most desirable employees in an organization can be identified by their productivity or by an even broader concept, their *quality*. Clearly, a person's quality as well as productivity is difficult to measure. Navy officers periodically receive performance evaluations, so-called fitness reports (FITREPs), which assess their performance in loose description of traits and scaled ratings. Performance ratings in FITREPs appear to be reliable variables for analysis and are easily identified. However,

these ratings could be influenced by supervisor biases, and they do not represent the full productivity of a person. Still, researchers often draw conclusions about the overall performance of officers from these ratings (Mehay & Bowman, 2005; Maugeri, 2016; Ellison, 2014).

The performance evaluation is a widely accepted approach to quantifying a person's job performance. Nevertheless, research suggests that performance management (PM) ratings are not a reliable predictor of actual performance. More importantly, ratings have shown no correlation with business unit performance (Corporate Executive Board Corporate Leadership Council, 2012). The main reason why traditional performance appraisals fail to effectively improve performance seems to relate largely to the design of these appraisal systems—which rely on prescribed schedules, requirements to follow steps in a process, and other factors that lack flexibility (Pulakos & O'Leary, 2011). In an attempt to address these issues, high-profile companies, such as Adobe and Microsoft, eliminated their formal PM process. Despite not providing any increased performance for a business, PM ratings still offer a useful tool to compare persons for pay increases, promotions, and other personnel actions. While they do not drive business success, performance ratings in a highly structured, formalized process are still commonly used in the military.

Identifying the productivity—or measurable quality—of a Navy officer depends on the definitions of quality and the value of performance in an organization. Normally, there is no variable called "productivity." In addition to traditional performance measurements, productivity consists of other factors such as personality, family concerns, and external support. The actual correlation of productivity and performance ratings has been discussed qualitatively in previous research, but few, if any, studies have attempted to examine this correlation quantitatively. The key underlying problem involves measuring actual productivity. Different approaches to quantify productivity have been pursued over the years, yet none is compelling or considered superior to other approaches. Thus, researchers often use indicator variables and assume there is a high correlation between them and actual productivity. Mehay and Bowman (2005), for example, employ the terms "productivity" and "performance ratings" synonymously.

This particular study, which looks at marital status and productivity, also relies heavily on rating measurements to determine productivity (Mehay & Bowman, 2005).

2. Female Officer Retention and Dual-Military Couples

In 1973, the United States abolished the draft and established the All-Volunteer Force (AVF). This significant shift toward staffing the military was a result of a changing national landscape politically and socially as well as a new perspective on national security. One major issue addressed by the AVF was the growing concern among U.S. citizens about the fairness of military conscription (Rostker, 2006). Another issue was related to the increasing need for highly qualified, professional, career-minded personnel who were capable of operating and maintaining more modern technology in the military. The AVF was intended in part to enhance the capabilities and professionalism of service members by enabling the armed forces to invest more time and resources in their training and education (Rostker, 2006).

As members stayed longer in the military after transition to the AVF, the services soon recognized that the retention decisions of officers and enlisted personnel often depended heavily on the family's happiness with military life (Clever & Segal, 2013). Thus, the wellbeing of military families became an increasingly more significant concern of the services as the years progressed. As the Department of Defense (2015b) has shown in its Table D-18, service members today stay longer in service than they did in 1973, and they are older on average. Table D-14 of the same source showed that the percentage of married enlisted also increased from 1973 to 2014. It is assumed the percentage of married officers increased, too—although the magnitude may not have been as significant given that, in general, officers enter service older than enlisted personnel. Rising numbers of married service members and dependent children carried additional burdens and demands on their families' lives compared with their civilian counterparts.

Among the many different demands on service members, the requirement to move relatively often over long distances over the course of a career is expected. Labor economists refer to the dynamics and decisions made in connection with moving and job change as a *family-migration decision* and describe the employee or spouse as a *tied*

mover, someone who sacrifices better job opportunities at the current location to move with the family, or a *tied stayer*, someone who sacrifices better job opportunities at another location to stay with the family (Borjas, 2008, p. 331). In general, family migration is associated with higher total earnings for a family as a whole because a family unit tends to move voluntarily when total earnings are better elsewhere. Other factors, such as a more enjoyable job or better quality of life, further influence a moving decision. Apparently, the effect on a family's total earnings does not hold true for military families because the post-migration earnings of a military member's civilian spouse are often lower. While the member's earnings depend on military rank and likely stay the same after the move, the trailing spouse's income is often lower than before the move (Borjas, 2008). Research identifies an acceptance of such earning penalties in military families—and mostly by the civilian women moving with their military husbands—resulting potentially in deliberate unemployment or under-employment of the civilian spouses (Harrell, Lim, Castaneda, & Golinelli, 2004).

Military families also face certain unique challenges by so-called quality-of-life issues. For example, research shows that children in a military family tend to experience a performance drop in school, depending on the number of deployments and deployment length of the military parent (Arkes, 2015). A non-working spouse can compensate for a lot of these issues (Brummond, 2015) but has to further sacrifice her or his own development and career, as Hosek, Asch, Fair, Martin, and Mattock (2002) have described.

Previous studies further indicate a significant earnings gap between military families with a husband in the military compared with families in which a wife is serving in the military. Little and Hisnanick (2007) and Hosek et al. (2002) have shown that a tied-mover spouse tends to work less and for lower wages and that the earnings gap is smaller when the tied-moving spouse is the husband. In general, they revealed that military families typically earn less than civilian ones, and military spouses on average account for roughly 50 percent of their lower family earnings. Because both partners in a dual-military marriage are employed and are paid according to their military rank, the earnings penalty is probably lower, on average, than it is for families in which just one

partner is in the military. At the same time, one could argue that at least one partner in a dual-military marriage sacrifices his or her career progress (a tied mover or a tied stayer), essentially accepting lower lifetime earnings.

Earnings differences between men and women in working couples are well established in previous research (Hertz, 1986; Hardill & Watson, 2004). Further, in dual-military couples, men usually plan to stay in service and pursue careers earlier, thus accumulating higher pay and facing better career opportunities (Teplitzky, Thomas, & Nogami, 1988). Men are more likely to have graduate education or to obtain it through their careers; thus, they accumulate higher human capital and are more likely to progress through the ranks (Mundell, 2016). Another approach to explain earning differences is the idea of assertive mating, which assumes that men are more likely to marry women with lower levels of education (Mare, 1991). Based on these research findings, an imbalance between men and women is expected in their contributions to the overall outcome of military families. Additionally, labor economics theory suggests that a dual-earning household often moves with the dislocation of the higher-earning partner, putting the other partner in the position of a tied mover, sacrificing existing job opportunities for the good of the family. Thus, on average, in a heterosexual marriage, wives are less likely than husbands to find optimal conditions for pursuing their careers (Little & Hisnanick, 2007).

From a military perspective, all of the challenges put on the family by one partner being a service member at least "doubles" for dual-military families. Deployments of at least one parent at a given time are more likely; thus, schooling issues for the children become more likely. While having one partner deployed, the family or household responsibilities for the other partner increase significantly. Moving one partner for career purposes without assigning the other partner to the same location or a close duty station puts added stress on all family members. These stressors, or "shocks," compel all family members to react. Usually, the partner who contributes less to the family's financial income deals mainly with such "shocks" and potentially sacrifices one's career progress for the family's sake. As previously discussed, the female partner in a heterosexual marriage is more likely to be that person. Notably, the Navy has recently attempted to

reduce the impact of such shocks on dual-military couples by ordering detailers to give top priority to finding collocated assignments for Navy partners once their partners are about to be transferred (NAVPERSCOM, 2015). This policy also orders the Navy detailers to cooperate with the detailers of other services if the spouse is in another service and to evaluate the possibility of assignment of both partners in a dual-military marriage to the same location.

Being in a dual-military marriage further affects any retention decision of these members. When Mundell (2016) studied the retention decisions of female junior officers in the Navy, he found that their retention rates tended to be lower than those of their male counterparts. The exceptions were for women who obtained graduate education, were allowed to transfer laterally into other communities, or were married.

About 40% of married women in the Navy are living in a dual-military marriage (see Table 2); the Navy may address women's retention rates by further supporting dual-military families. Indeed, the Navy has been striving to provide such support and to more fully understand the dynamics within these families.

3.   Demographic Statistics

The Department of Defense's (2015a) report, *2014 Demographics: Profile of the Military Community*, presents statistics on members and families in the military community. As of 2014, active-duty military personnel comprised more than 1.3 million enlistees and officers, which represent 37.3% of military personnel. The Navy, as the second-largest service, accounted for roughly 321,000 active-duty personnel (50.5% of total Navy personnel), including 54,440 officers (23.1% in officer corps). Of these officers, 17%, or 9,248, were women, and 83%, or 45,192, were men (Department of Defense, 2015a, p. 20).

Table 1 shows the proportion of married military members in 2014 who were in dual-military couples, in which both partners served on active duty in a military branch.

Table 1.   Percentage of Married Active-Duty Enlisted Members and Officers
               in Dual-Military Marriages by Service Branch, 2014

	Army	Navy	Marine Corps	Air Force	Total DoD
Enlisted	8.8%	10.4%	8.6%	20.6%	12.0%
Officers	9.7%	8.0%	6.3%	15.3%	10.5%
Total	**9.0%**	**9.9%**	**8.2%**	**19.3%**	**11.7%**

Source: Department of Defense (2015a). *2014 Demographics: Profile of the Military Community.* Washington, DC: Office of the Deputy Assistant Secretary of Defense, Military Community and Family Policy.

As presented in the table 8.0% of married officers in the Navy were in a dual-military marriage as of 2014, which is lower than in the Army and in the Air Force as well as lower than the DOD average (10.5%), but still higher than in the Marine Corps (6.3%). In relation to all Navy active-duty officers, officers in dual-military marriages rose from 4.6% in 2005 to 5.4% in 2014 (Department of Defense, 2015a, p. 51).

Table 2 shows the percentage of married active-duty service members in dual-military marriages.

Table 2.   Percentage of Married Active-Duty Members in Dual-Military
               Marriages by Service Branch and Gender, 2014

Gender of Active Duty Member	Army	Navy	Marine Corps	Air Force	Total DoD
Male	5.1%	5.5%	4.9%	12.3%	6.8%
Female	39.2%	39.1%	57.5%	55.1%	45.5%
Total	**9.0%**	**9.9%**	**8.2%**	**19.3%**	**11.7%**

Source: Department of Defense (2015a). *2014 Demographics: Profile of the Military Community.* Washington, DC: Office of the Deputy Assistant Secretary of Defense, Military Community and Family Policy.

As seen in Table 2, a relatively high proportion of married female personnel (officers and enlistees combined) in the Navy—slightly over 39%—were in dual-military marriages as of 2014. This compares with 5.5% of their male counterparts, a striking difference of over 33 percentage points. Stated differently, married women in the Navy are over seven times more likely than their male counterparts to be in dual-military marriages. The differences in these rates, by gender, are substantial across all services, particularly in the Marine Corps, in which married women are over 11 times more likely

than men to be part of dual-military marriages (Department of Defense, 2015a). It should be noted that comparable data on Navy officers in 2014 could not be found.

As previously described, the present study focuses exclusively on Navy officers, and available statistics suggest that a significant portion of these officers, particularly women, are in dual-military marriages. Although dual-career couples have become increasingly common across the general population and throughout the world, when careers involve military service, the demands of working life and family life are more prone to clash (Segal, 1986; Long, 2008). The following discussion addresses some of the challenges confronting partners of dual-military marriages.

B.   LITERATURE REVIEW

To build the research framework for this study, this section reviews a 2012 RAND study on retention of female officers in the Navy, a 2013 paper on marital status and Navy officer productivity from the Center for Naval Analyses (CNA), and a related study on female Navy officer performance conducted at the Naval Postgraduate School (NPS) in 2016. The review focuses mainly on the purpose, methodology, and results of each previous study.

1.   Female Officers and Dual-Military Families

In 2013, the Department of the Navy issued the *21st Century Sailor and Marine Initiative* to maximize force readiness to meet the current and future demands of the Navy. Five focus areas were established: readiness, safety, physical fitness, inclusion, and continuum of service (Department of the Navy, 2013). Inclusion refers to equal opportunity approaches to strengthen diversity and to foster different perspectives and expertise in the Navy and Marine Corps.

The Under-Secretary of Defense for Personnel and Readiness tasked the RAND Corporation to update previous research on career progression of women in the military (Department of Defense, 1999). The findings were published by Asch, Miller, and Malchiodi (2012), focusing on gender and minority differences in retention and promotion between white males and other racial groups and between males and females.

The authors emphasized their aim to describe these differences by race, ethnicity, and gender, not to identify the reasons for those differences.

Asch et al. (2012) studied male and female retention and promotion to all ranks using a Proxy-PERSTEMPO data file provided by the Defense Manpower Data Center (DMDC), a longitudinal record of active-duty personnel from 1988 through 2010 across all services. The study found that female retention (expressed as "Retention as rank O-1 through O-5") was lower than for white men—except for black women, whose retention rates did not differ from that of men. These findings are roughly consistent with earlier RAND studies.

Retention and promotion to all ranks were considered milestones in officers' careers (see Table 3). Officers who did not become eligible for particular milestones due to leaving the service were not included in the models. Retention was measured as conditional upon achieving the previous grade and up to eligibility for the next promotion.

Table 3.   Dependent Variables Used by Asch et al. (2012)

Career Progression Milestones and Cohorts Used in the Analysis

Career Milestone Number	Career Milestone	Entering Cohorts Used
1	Retained as O1	1988–2002
2	Promoted to O2	1988–2002
3	Retained as O2	1986–2002
4	Promoted to O3	1986–2002
5	Retained as O3	1983–2002
6	Promoted to O4	1983–1999
7	Retained as O4	1977–1993
8	Promoted to O5	1977–1993
9	Retained as O5	1971–1991
10	Promoted to O6	1971–1991

Source: Asch, B. J., Miller, T., & Malchiodi, A. (2012). *A new look at gender and minority differences in officer career progression in the military.* Santa Monica, CA: RAND Corporation.

Figure 1 shows the applied model, wherein j is one of the 10 career outcomes shown in Table 3, and i is the individual officer. D is a set of key variables: dummy variables for race, ethnicity, and gender. X is a set of control variables including marital status, education, occupational group, and deployment experience.

$$\Pr\left(outcome_j = 1\right) = F\left(D_i \delta + X_i \beta\right)$$

Figure 1. Model Used by Asch et al. (2012) to Estimate Career Progression.

The study also found that women across all ranks and regardless of ethnicity were less likely than white males to promote to O-2, O-3, and O-4. Furthermore, once these women reached the O-4 level, they were less likely to promote to O-6. The one exception to lower promotion rates, the authors identified, was for black women, who promoted at nearly the same rate to O-3 as white males.

One of the study's limitations, as Asch et al. (2012, p. xiv) admit, is the "myriad [of] other possible contributors to differences in career progression" for which they did not control. This thesis aims to shed light on some of these other contributors—specifically on how marital status may affect job performance.

The CNA study by Kraus, Parcell, Reese, and Shuford (2013) examined the retention of female officers in the Navy's surface warfare and aviation communities. The authors aimed to identify explanatory factors in the lower retention and promotion rates among women and racial/ethnic minority groups compared to their white male counterparts. Kraus et al. (2013, p. 3) used data from the Navy's Officer Master File (OMF), received annually by CNA since the mid-1970s, and modeled retention probability as a function of "personal and military career characteristics." Specifically, the regression model for retention at three to nine years of commissioned service (YCS 3–9) controlled for two groups of variables: demographic variables (race, ethnicity, marital and dependent status, and college major) and Navy career variables (year-group cohort, accession source, lateral into SWO, nuclear subspecialty, and ship type). Two

additional variables were included to reflect a ship's crew composition and to compare military and civilian pay as an indicator for civilian job opportunities.

While some factors affected male and female retention similarly (e.g., college major, accession source, nuclear subspecialty), the authors found some factors (e.g., number of dependents and marital status) affected female and male officers' retention rates differently. While married male surface warfare officers (SWOs) retain at a higher rate than single men, married female SWOs do not retain at a significantly different rate than do their single peers. Kraus et al. (2013) explained this effect was the result of a small sample size in their study, but their model did not differentiate between SWO losses from the Navy and SWO losses into other communities (lateral transfers). They further noted that female officers were more likely to be married to other service members (i.e., dual-military marriages), and career-management considerations were more likely to influence career decisions such as lateral transfers.

In an attempt to broaden the research on female retention to a wider spectrum of communities, Mundell's (2016) NPS thesis examines the retention and promotion of female junior officers in the Navy. Using data on retention to the minimum service requirement (MSR) of six years, retention to 10 years of service, and promotion to O-4, and controlling for demographics, professional, transition, and cohort year variables, Mundell examined factors likely to explain observed differences in retention and promotion to O-4 rates between female and male Navy officers. He found that women are less likely than men to stay in the Navy at six and 10 years of service but have promotion rates no different than men.

Table 4 shows the MSR retention separated for female and male Navy officers. Similarly, Table 5 shows the 10-year retention for female and male Navy officers.

Table 4.　　　MSR Retention Probit Model Results for Women and Men:
Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	0.0032	0.0011	Unkn_Commissioning	0.1065	-0.0173
	(0.0037)	(0.0011)		(0.0925)	(0.0380)
Hispanic	-0.0079	0.0012	SWO	0.0403	0.0250***
	(0.0363)	(0.0093)		(0.0296)	(0.0082)
Black_NonHisp	0.0488	0.0078	SUB	n/a	0.0608***
	(0.0336)	(0.0098)		n/a	(0.0065)
Asian	0.0463	-0.0015	SPEC	0.1123	0.0503***
	(0.0382)	(0.0120)		(0.1468)	(0.0082)
Other_Unkn_Race	-0.1375*	-0.0135	RL	-0.0348	-0.0066
	(0.0712)	(0.0173)		(0.0468)	(0.0122)
Married_6	0.4265***	0.2798***	Unqual_Line	0.1592***	0.0462***
	(0.0196)	(0.0122)		(0.0304)	(0.0080)
Dep_Children_6	0.2110***	0.0764***	Lat_Transfer_4	0.3126***	0.0780***
	(0.0340)	(0.0096)		(0.0163)	(0.0057)
Naturalized	0.1235**	-0.0184	Cohort_FY00	0.0196	-0.0115
	(0.0578)	(0.0254)		(0.0317)	(0.0091)
Grad_Educ	0.3670***	0.1618***	Cohort_FY01	-0.0363	-0.0294***
	(0.0191)	(0.0084)		(0.0334)	(0.0105)
NROTC	-0.1180***	-0.0211**	Cohort_FY02	-0.0629*	-0.0429***
	(0.0355)	(0.0085)		(0.0372)	(0.0118)
Academy	-0.0601	0.0289***	Cohort_FY03	-0.0724*	-0.0603***
	(0.0440)	(0.0076)		(0.0380)	(0.0134)
Direct	-0.0110	-0.0600***			
	(0.0360)	(0.0190)			
Other_Commissioning	0.0341	-0.0009	Observations	2,524	8,999
	(0.0645)	(0.0182)	Mean Retention Rate	0.563	0.750

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Mundell, D. (2016). *Study of Female Junior Officer Retention and Promotion in the U.S. Navy* (Master's thesis, Naval Postgraduate School).

Table 5. Ten-Year Retention Probit Model Results for Women and Men: Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	0.0243***	0.0188***	Unkn_Commissioning	-0.1430*	-0.0827**
	(0.0038)	(0.0021)		(0.0742)	(0.0408)
Hispanic	0.0154	-0.0225	SWO	-0.2199***	-0.2403***
	(0.0403)	(0.0194)		(0.0304)	(0.0157)
Black_NonHisp	0.0649	-0.0051	SUB	n/a	-0.3062***
	(0.0413)	(0.0222)		n/a	(0.0174)
Asian	-0.0044	-0.0154	SPEC	-0.0821	0.0059
	(0.0457)	(0.0265)		(0.2006)	(0.0362)
Other_Unkn_Race	-0.0535	0.0462	RL	-0.1482***	-0.1787***
	(0.0604)	(0.0295)		(0.0433)	(0.0248)
Married_6	0.2588***	0.2971***	STAFF	-0.0952**	-0.1487***
	(0.0271)	(0.0115)		(0.0372)	(0.0206)
Dep_Children_6	0.2302***	0.1381***	Unqual_Line	-0.0482	-0.1568***
	(0.0428)	(0.0139)		(0.0465)	(0.0212)
Naturalized	0.1387	0.0458	Lat_Transfer_6	0.4930***	0.2500***
	(0.0861)	(0.0431)		(0.0316)	(0.0143)
Grad_Educ	0.5952***	0.5057***	Cohort_FY00	0.0185	-0.0059
	(0.0189)	(0.0080)		(0.0370)	(0.0172)
NROTC	-0.0593*	-0.0082	Cohort_FY01	0.0150	0.0234
	(0.0350)	(0.0152)		(0.0365)	(0.0172)
Academy	-0.0117	0.0460***	Cohort_FY02	0.1073***	0.0699***
	(0.0427)	(0.0167)		(0.0391)	(0.0172)
Direct	-0.0276	0.0122	Cohort_FY03	0.1250***	0.0838***
	(0.0387)	(0.0288)		(0.0407)	(0.0180)
Other_Commissioning	0.0246	-0.0091	Observations	2,968	13,128
	(0.0540)	(0.0218)	Mean Retention Rate	0.384	0.564

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Mundell, D. (2016). *Study of Female Junior Officer Retention and Promotion in the U.S. Navy* (Master's thesis, Naval Postgraduate School).

Tables 4 and 5 show the MSR and 10-year retention regression results for female and male officers. Clearly, the retention rates between women and men are significantly different in both models. At MSR, women are 2.7% less likely to retain than their male counterparts; at 10 years, the gap increased to 12% less likely.

Table 6 shows the promotion to O-4 estimates for both genders.

Table 6.   Promotion to O-4 Probit Model Results for Women and Men:
Marginal Effects

VARIABLES	M.E. (Women)	M.E. (Men)	VARIABLES	M.E. (Women)	M.E. (Men)
Age	-0.0170***	-0.0098***	Unkn_Commissioning	0.0689	0.0490**
	(0.0040)	(0.0018)		(0.0683)	(0.0243)
Hispanic	0.0214	-0.0291	SWO	0.0672*	-0.0139
	(0.0435)	(0.0202)		(0.0350)	(0.0146)
Black_NonHisp	-0.0582	-0.0436**	SUB	n/a	-0.0148
	(0.0410)	(0.0210)		n/a	(0.0188)
Asian	0.0388	-0.0706**	SPEC	0.0456	0.1098***
	(0.0493)	(0.0280)		(0.1640)	(0.0194)
Other_Unkn_Race	0.0545	-0.0208	RL	0.0838*	-0.0211
	(0.0660)	(0.0295)		(0.0472)	(0.0237)
Married_6	0.0615**	0.0966***	STAFF	0.2357***	0.0951***
	(0.0266)	(0.0129)		(0.0392)	(0.0142)
Dep_Children_6	0.0198	0.0161	Unqual_Line	0.1273***	0.0799***
	(0.0338)	(0.0120)		(0.0343)	(0.0165)
Naturalized	0.0222	0.0153	Lat_Transfer_6	0.1734***	0.1263***
	(0.0674)	(0.0327)		(0.0229)	(0.0101)
Grad_Educ	0.2501***	0.2000***	Cohort_FY00	0.0455	-0.0039
	(0.0275)	(0.0108)		(0.0384)	(0.0171)
NROTC	-0.1807***	-0.0136	Cohort_FY01	-0.0088	0.0092
	(0.0502)	(0.0147)		(0.0418)	(0.0166)
Academy	-0.0993*	-0.0367**	Cohort_FY02	-0.0042	-0.0802***
	(0.0598)	(0.0172)		(0.0425)	(0.0189)
Direct	-0.0676	-0.0749**	Cohort_FY03	-0.0880*	-0.3380***
	(0.0485)	(0.0295)		(0.0510)	(0.0229)
Other_Commissioning	-0.0300	0.0016	Observations	1,141	7,401
	(0.0539)	(0.0185)	Mean Retention Rate	0.765	0.773

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Mundell, D. (2016). *Study of Female Junior Officer Retention and Promotion in the U.S. Navy* (Master's thesis, Naval Postgraduate School).

In the current system of promotion and retention in the Navy, promotion can lead to retention. Consequently, for Navy officers who stayed at least 10 years, Mundell (2016) found a mean retention probability of 76.5% for women and 77.3% for men among those who were promoted to O-4. Such similarities between women and men suggest that the Navy's policies and incentives are working effectively. Interestingly, a successful lateral transfer by six years of service had a significant positive impact on promotion to O-4 for both genders. Service members who were deemed high-quality and, thus, allowed to transfer laterally rather than being forced out, seemed more satisfied and tried to stay in the Navy longer.

The findings in Mundell (2016) support earlier research showing that the overall retention rate for female Navy officers tends to be lower than that of their male

counterparts. This gap increases from the MSR to 10 YOS. However, officers who obtain graduate education, are married, or have dependent children by six YOS are more likely to pursue a full career in the Navy. Mundell (2016) speculates that married officers likely stay longer in service to support their families while considering lateral transfers more often to improve their quality of life or work-life balance.

This thesis uses the same dataset Mundell used, supplemented by another dataset providing the dual-military information. Mundell showed that promotion to O-4 and retention can be modeled from this dataset and yield meaningful results. Furthermore, the chosen variable groups—demographics, marital information, Navy community, commissioning source, and cohort year—provide valuable insight into retention and promotion decisions. As both promotion and retention indicate performance, this study uses the same approach to estimate performance and identify factors affecting military job performance.

Female service members—in a prevalent, more traditional role—still need to address family issues more often than men. In a RAND survey, Gates, Zellman, and Moini (2006) found that parents expressed willingness to leave the military because of inadequate childcare arrangements. For parents of pre-school-aged children, they suggest that income level has an impact on unmet child-care needs. As both parents contribute to the income, dual-military families are the least likely to experience unmet needs. However, dual-military families are more likely to report unmet preferences when having school-aged children. Unmet preferences eventually lead to a retention decision unfavorable for the military. According to Gates et al. (2006), 21% of the surveyed parents stated that it was likely or very likely that they would leave the military because of child-care issues. Moreover, the authors found that dual-military families are especially prone to leave the military because of child-care issues.

Other aspects of dual-military families are also particularly stressful for women. In a Master's thesis, Johnson (1987, p. viii), defining stressors, noted that, even though women in his study characterized their marriages as egalitarian, they were "still ultimately responsible for childrearing and housekeeping. Husbands [were] not doing their fair share." This account may have changed a bit since the 1980s, although the

military usually cultivates a traditional worldview with traditional values. Consequently, women in dual-military marriages rank their roles as mother first, followed by wife and Navy officer.

Occasional stressors, or family shocks, hit the dual-military family harder than other family types because both parents work on very rigid military schedules and both parents are prone to be deployed, leaving the staying parent responsible for all family and career issues given the geographical distance between spouses' duty stations. All of these stressors impact the job performance of service members. In its attempt to retain talent and to have officers performing at their best, the Navy needs to understand the stressors as well as their actual impact on performance and retention of service members in dual-military families.

2.   Productivity and Performance

The present study aims to examine the relationship between dual-military marriage and a Navy officer's productivity. Although previous studies of marital status and job productivity may include dual-income couples, few have examined the military aspects of marital status and a person's general performance. In exploring wage-earning differences between genders, Mehay and Bowman (2005) tested concepts from labor economics with findings in the field of military manpower by looking for evidence of higher performance ratings and earlier promotion (which corresponds with labor economics' well-established wage premium for married men) among male service members.

In their paper, Mehay and Bowman (2005) found that married Navy officers receive a marriage premium over single men. They sought to analyze "the existence and magnitude of job-productivity differentials between married and single males" (Mehay & Bowman, 2005, p. 74). Although wage premiums for married men are well-documented in labor economics, related studies over the years have come to differing conclusions. Mehay and Bowman (2005) appropriately addressed these conflicting results, affirmed existing knowledge, broadened the scope toward the military environment, and managed to reinforce an already-known mechanism using a large dataset of the U.S. Navy.

The authors assumed that performance ratings and promotions reflect productivity and argued their point effectively when presenting evidence and interpreting results. They relied heavily on two performance indicators: recommendation for accelerated promotion (RAP) scores and promotion outcomes. In earlier research (Neumann, Mattson, & Abraham, 1989), the RAP score showed significant variation and was validated as a predictor of job performance. Nevertheless, one could also claim that such ratings and promotions are essentially rewards for more than mere job productivity, and they may be influenced by external or intervening factors—including individual career perspectives, personal traits, superiors' limitations when producing personnel evaluations, or institutional biases. Consequently, although Mehay and Bowman (2005) do not distinguish between performance indicators and productivity, applying the terms synonymously, it is important to recognize that performance ratings can be influenced by a number of factors other than productivity. Stated differently, performance ratings may not reflect actual productivity, but more importantly, a person's positive contributions to an organization include more than some determination of that person's productivity.

A person's aptitude is reflected not only by performance but also by "soft factors." More qualitatively, Brummond (2015) discussed job commitment, which is supposed to be one crucial aspect of an officer's job performance. The author utilized a DMDC survey from 2008 to explore the term "greedy institution" (Segal, 1986) as it relates to the military in wartime, as well as military families, and its effect on work attitudes. Institutional greediness in these circumstances is described as a state that severely limits the time and energy one can spend on other activities or aspects of life. Brummond (2015) stated that the extraordinary family benefits of the military make the institution less greedy and affect service members' commitment positively.

The author found significantly lower commitment among women in dual-military marriages and explained that, when both partners work in high-demand jobs, household obligations still tend to fall more on the woman. Using relatively new data from 2008, Brummond (2015) still found traditional role models, even in dual-military marriages when the military occupational demand was high on both partners. This finding supports

the assumption that women in a dual-military marriage show lower performance if the correlation between commitment and performance holds true.

Evidence found in Brummond's (2015) study demonstrates that the military's greediest aspect is separation, and separation has the greatest impact on job commitment. At the same time, mobility and separation put a tremendous amount of stress on military children because they tend to have more difficulties readapting (Ender, 2000). Thus, this thesis expects to find parents showing less commitment, especially when experiencing geographic separation. Actual results suggest a contrary view: those with children have significantly higher career commitment.

In an earlier study, Lakhani and Gade (1992, p. 153) showed a similar effect: retention was positively correlated with "perceived spouse's intention to stay in the Army, family income, family size, career commitment, and job satisfaction." As commitment is part of an officer's performance, this thesis controls for parental and separation stressors when examining performance.

3.   Performance Modelling

Military performance measures usually include FITREP data. Mehay and Bowman (2005) as well as Maugeri (2016) developed metrics of on-the-job performance from FITREP data.

Maugeri used the *early promotion (EP) recommendation* at 72 and 120 months, derived as continuous variables, defined as the number of early promotion recommendations officers receive in their first six or 10 years of service, respectively. The number of FITREPs in these timeframes may differ from one officer to another because, in addition to the annual FITREPs, an officer gets a FITREP when she or he changes duty station or when the reporting senior officer changes. To obtain comparable information, Maugeri (2016) calculated the percentage of recommendations from the total number of FITREPs received by an officer.

Little evidence was found for a marriage advantage in Maugeri's research. Only in the O-4 promotion probability model did married unrestricted line (URL) officers have

a significantly higher promotion rate when compared with single officers. However, for restricted line and staff officers, as well as in the two EP models, no differences were found between married and unmarried officers. Maugeri's models did not account for dual-military marriages or disruptions in family life that may further affect individual performance—which is ultimately the focus of this study.

The type of model described by Maugeri (2016) has been frequently used to analyze military personnel data (Karakaya, 2011; Mundell, 2016; Clark, 2016). Datasets available for this study provide similar variables and information content. Thus, this study uses such a model to investigate job performance differences between dual-military officers and other officers.

C.   SUMMARY

A number of studies have indicated that having a family while serving in the military affects the retention decisions of military members, and more so for married couples and parents (Segal & Segal, 2006; Burrell, Adams, Durand, & Castro, 2006). Previous research suggests that a dual-military marriage status tends to place an increased burden on a service member's family life over that of a traditional military family with one civilian spouse. Colocation issues, frequent deployment of both partners, and schooling for children, among other work-life factors, can have a great impact on a dual-military partner's quality of life. Sacrificing career progress for one's family seems more likely in a dual-military marriage, as Brummond (2015) suggests by highlighting career commitment.

The Navy's talent-management initiative strives to develop and retain service members demonstrating the highest performance. In a first step, the Navy needs to identify these "high performers," which leads ultimately to a ratings system such as FITREP scores. The underlying difficulty is in defining productivity and then determining how to measure it. Typically, indicator variables related to promotion and retention are often used as substitutes for productivity. The present study needs to follow the same approach as available data rely on the existing FITREP system.

None of the current literature aims to define or identify the performance of a household, that is, the aggregated performance of both partners. This study uses the same type of variables to indicate individual performance, develops aggregate metrics for the performance of dual-military couples, and compares them with performance scores of single Navy officers. In a second step, the present study examines how these performance ratings behave over time, in an effort to find whether one or both partners in a dual-military marriage change their performance significantly, and tries to identify the reasons for such a change.

III. DATA DESCRIPTION AND STATISTICS

A. INTRODUCTION

This chapter provides a description of the dataset used in this thesis and presents summary and descriptive statistics. The data description describes the dataset and defines the variables used later in the analysis. Summary and descriptive statistics compare means and variables from different subsets of the data to better illustrate the data set.

B. DATA DESCRIPTION

One of the two datasets utilized in this study was provided by the Defense Manpower Data Center (DMDC). It was preselected to include only active duty, full-time support (FTS) and selected reservists who joined the Navy in five consecutive cohorts from fiscal year 1999 to fiscal year 2003. Limited duty officers (LDOs), chief warrant officers (CWOs), and officers entering in pay grades above O-1, such as medical, legal and religious officers, were not included in the dataset. The data include observation on 16,143 Navy officers, followed annually from commissioning to the end of fiscal year 2016 or until separation. This dataset is referred to as the main dataset.

A subset of this dataset contains information on fitness reports (FITREPs), for a total of 8,552 officers. The FITREP dataset is used to examine the performance of service members in dual-military marriages. FITREP data consist of an individual's trait scores, trait average, and recommendation for early promotion, along with some administrative data. Trait scores, although weighted by the average score of the reporting senior officer, do not represent an objective performance measure. Actual scores depend on the comparison group of the individual. Within a strong comparison group, the individual's scores eventually drop; within a weaker comparison group, they may rise—although the objective performance of an officer may be the same. As shown by Mehay & Bowman (2005), the early promotion (EP) recommendation has been previously validated as a predictor of job performance. Consequently, EP recommendations from the FITREP dataset are used as a performance indicator in this study.

An additional data source consists of extracts from the Officer Personnel Information System (OPINS). These OPINS extracts were merged with both the main and FITREP datasets and used to add a binary variable indicating a dual-military marriage as well as household variables such as collocation information, number of dependent children, and spouse's military information.

Tables 7 and 8 show the distribution of officers in dual-military marriages in the main and FITREP datasets, respectively.

Table 7.   Distribution of Dual-Military Marriages – Main Dataset
(n = 16.143)

Cohort (Fiscal Year)	Number of Observations	Dual-Military Marriage
1999	2,961	166
2000	3,355	197
2001	3,403	206
2002	3,322	196
2003	3,102	153
Total	**16,143**	**918**

Table 8.   Distribution of Dual-Military Marriages – FITREP Dataset (n = 8,552)

Cohort (Fiscal Year)	Number of Observations	Dual-service Marriage
1999	1,712	117
2000	1,815	124
2001	1,841	119
2002	1,642	123
2003	1,542	86
Total	**8,552**	**569**

Both tables show even distributions of dual-military marriages in all cohorts. Both datasets are representative of the full sample. Dual-military couples make up approximately 5.7% of the main dataset and 6.7% of the FITREP dataset.

Tables 9 and 10, below, show the distribution of officers by marital status after six years of service, after an officer's first decision is made to either stay in or leave the military.

Table 9.   Main Dataset Distribution of Marital Status by Sixth Year of Service
(n = 11,198)

Cohort (Fiscal Year)	Married (Dual)	Married (Civ-Mil)	Single	Total
1999	93	1,317	777	2,187
2000	109	1,450	824	2,383
2001	127	1,476	784	2,387
2002	101	1,290	817	2,208
2003	77	1,270	686	2,033
Total	507	6,803	3,888	11,198

Table 10.   FITREP Dataset Distribution of Marital Status by Sixth Year of
Service (n = 7,350)

Cohort (Fiscal Year)	Married (Dual)	Married (Civ-Mil)	Single	Total
1999	71	936	509	1,516
2000	76	1,028	496	1,600
2001	82	1,020	464	1,566
2002	71	845	460	1,376
2003	53	837	402	1,292
Total	353	4,666	2,331	7,350

After six years, the percentage of officers in a dual-military marriage drops to 4.5% in the main dataset and 4.8% in the FITREP dataset.

Tables 11 and 12 show the distribution after 10 years of service, that is, after the second retention decision is made—the first retention decision considered competitive and, therefore, potentially indicative of performance.

Table 11.	Main Dataset Distribution of Marital Status by 10th Year of Service
(n = 8,035)

Cohort (Fiscal Year)	Married (Dual)	Married (Civ-Mil)	Single	Total
1999	76	960	469	1,505
2000	82	1,054	512	1,648
2001	75	1,121	523	1,719
2002	82	1,036	509	1,627
2003	76	1,003	457	1,536
Total	391	5,174	2,470	8,035

Table 12.	FITREP Dataset Distribution of Marital Status by 10th Year of
Service (n = 6,091)

Cohort (Fiscal Year)	Married (Dual)	Married (Civ-Mil)	Single	Total
1999	68	829	365	1,262
2000	65	864	393	1,322
2001	53	864	385	1,302
2002	63	758	343	1,164
2003	59	708	274	1,041
Total	308	4,023	1,760	6,091

In both datasets, the percentage of dual-military marriages increases—by 10 years of service, 4.9% from the main dataset and 5.1% from the FITREP dataset live in dual-military marriages. This relative increase could indicate a better overall retention of Navy officers in dual-military marriages. These results further indicate that both datasets seem to be fairly good representations of the population.

## 1.	Dependent Variables

Table 13 lists all the variables used in this study. The dependent variables include retention to 10 years of service, promotion to lieutenant commander (O-4), and recommendation for early promotion. The first two dependent variables are identified from the main dataset, the latter from the FITREP dataset.

Table 13.   Variable Definitions

Variable	Definition
Dependent Variables	
Ten Year Retention	=1 if officer stayed in service more than 10 years, else=0
Promoted to O4	=1 if officer got promoted to rank LCDR (O-4), else=0
Percentage of EP	Percentage of Early Promotion Recommendations over first 10 YOS (FITREP only)
Independent Variables	
Demographics	
Age	Age of the officer at commissioning
Female	=1 if Female, else=0
Male	=1 if Male, else=0
White	=1 if White & NonHispanic, else=0
Black	=1 if Black & NonHispanic, else=0
Hispanic	=1 if Hispanic, else=0
Asian	=1 if Asian, else=0
Unknown Race	=1 if Race is not known, else=0
PostGraduate Education	=1 if Officer obtained Graduate Education, else=0
Marital Status	
Married at Comm.	=1 if married at commissioning, else=0
Not Married at Comm.	=1 if not married at commissioning, else=0
Dual	=1 if ever in a Dual-military marriage, else=0
EverMarried	=1 if ever in marriage while in service, else=0
Dual after 6 YOS	=1 if in a Dual-military marriage after 6 YOS, else=0
Collocation after 6 YOS	=1 if both partners at the same duty station after 6 YOS, else=0
Children after 6 YOS	Number of dependent children after 6 YOS
Civ_Mil after 10 YOS	=1 if ever married in a Civ-Mil marriage after 10 YOS, else=0
Dual after 10 YOS	=1 if ever in a Dual-military marriage after 10 YOS, else=0
Collocation after 10 YOS	=1 if both partners at the same duty station after 10 YOS, else=0
Children after 10 YOS	Number of dependent children after 10 YOS
Dep_Children_10	=1 if ever had Children by 10 YOS, else=0
Commissioning Source	
Naval Academy	=1 if commissioned from US Naval Academy, else=0
ROTC	=1 if commissioned from ROTC, else=0
OCS/OTS/PLC	=1 if commissioned from OCS, else=0
Direct	=1 if direct commissioned, else=0
Other Commissioning	=1 if other commissioning source, else=0
Unkn Commissioning	=1 if unknown commissioned, else=0
Navy Community	
SWO	=1 if Surface Warfare Officer, else=0
SUB	=1 if Submarine Officer, else=0
SPEC	=1 if Special Operations Officer, else=0
Aviator	=1 if Naval Pilot, else=0
RL/Staff	=1 if Restricted Line or Staff Community, else=0
Unqual. Line	=1 if Unqualified Line Officer, else=0
Cohort	
Cohort_FY99	=1 if commissioning happened in fiscal year 1999, else=0
Cohort_FY00	=1 if commissioning happened in fiscal year 2000, else=0
Cohort_FY01	=1 if commissioning happened in fiscal year 2001, else=0
Cohort_FY02	=1 if commissioning happened in fiscal year 2002, else=0
Cohort_FY03	=1 if commissioning happened in fiscal year 2003, else=0

Ten-year retention is a binary variable, which takes a value of "1" if the officer is still in service at 10 years of service, and a value of "0" is the officer separated before the 10 year of service mark. In contrast to retention at the minimum service requirement (MSR) of six years, retention at 10 years of service (YOS) has two unique aspects. Someone who retains after 10 YOS will likely stay until being eligible to retire at 20 YOS. Nevertheless, the Navy keeps only the officers who perform well and whose careers seem promising for the remainder of their service obligations. Therefore, the job performance is an important determinant for an officer's retention after 10 YOS. Second, someone still in service at ten years is eligible for promotion to O-4. An individual's performance assessment will have an impact on the retention decision. Analyzing 10-year retention also indicates to what extent officers in dual-military marriages want to stay on active duty.

Promotion to O-4 is defined as a binary variable, taking a value of "1" if the officer were successfully granted promotion to lieutenant commander (O-4), and "0" otherwise. Promotions to O-2 and to O-3 are considered almost automatic and relate little to performance (Asch & Warner, 2001). Being selected to O-4 is the first competitive selection process in a selection board. Officers are ranked, with the promotion representing the outcome of the performance assessment. Comparing O-4 promotions of officers in dual-military marriages to their peers indicates performance differences between these groups.

Percentage EP measures the percentage of Early Promotion Recommendation from all FITREP reports received over the first 10 YOS. This dependent variable is based on FITREP scores which are meant to capture job performance. The system of grading within a comparison group, however, creates biases; some of these scores (e.g., trait scores) are only relative indicators of performance and do not account for objective, sortable, and comparable performance evaluations. The one metric that proved sufficient and objective is the recommendation for early promotion (EP). Because superior officers give out only a limited number of EP recommendations, these are considered a strong indicator of high performance. Consequently, EP recommendations are independent from previous FITREPs, and the number of recommendations received by an officer over the

years is a sound representation of performance. However, the number of FITREPs may vary from one officer to another; thus, the percentage of EP recommendations is used in this study instead of counts. Percentage of EP is not binary, but a continuous variable, that means it can take on any value in range.

2. Independent Variables

Table 13 gives an overview of all independent variables used in this study, and provides their definitions. Independent variables are the same for both, the main and the FITREP datasets.

The demographics group includes variables such as age, gender, race, and marital status. *Postgraduate education* indicates any education beyond a bachelor's.

The marital status variables allow us to identify whether an officer is in a dual-military and civilian-military marriages at various times, such as commissioning after six years and 10 years of service.

Additional information at these points in time was pulled from the database to display the family's situation: the number of dependent children and the *collocation* variable that indicates whether both spouses live in the same place. Especially in the military, it is challenging for both partners to find billets at the same duty station without sacrificing career progress.

Commissioning sources may give the first clue to an officer's aptitude because only the top performing prospects are accepted to attend the Naval Academy. Other commissioning sources, however, might be more conducive to starting a family more.

The *Navy community* group describes whether an officer is restricted line or staff (RL/staff) or unrestricted line (URL) at commissioning. The latter is subdivided into surface warfare officers (SWOs), submarine officers (SUBs), special operations (SPECs), and aviators. The Navy community variables allow for examining effects of greater work–life balance—which is arguably the case in the RL/staff group—on the choice or willingness to marry, or even to marry another service member. The opposite could also be true—because of the marriage to another service member, an officer may decide to

request a lateral transfer—for shore-based duty as is predominantly the case in the staff community.

The *cohort* dummy variables are binary variables that indicate the commissioning year. These cohort variables aim to capture differences in the external factors, e.g., change of economic conditions, change in policies, or higher deployment rates, as the global war on terror induced at beginning of 2003.

C.   SUMMARY STATISTICS

This section shows the summary statistics for the full sample of 16,143 officers in the main dataset and the sample of 8,552 officers in the FITREP dataset, both comprising officers who were commissioned between 1999 and 2003.

Tables 14 and 15 examine the means of selected dependent and independent variables across the full sample and the dual-military marriage sample. Table 14 shows the variable means for the full samples. The variable *10-year retention* is capturing retention for officers who stayed beyond their MSR. The variables *promoted to O4* and *EP Pct at 10 YOS* are measured only for officers still in service at 10 years since commissioning.

Both datasets show similar means for the dependent and independent variables; thus, both datasets appear to be good representations of the population, and a sampling bias seems unlikely. Only the means of the main dataset are discussed in the following paragraphs; still, the same pattern appear in the FITREP dataset.

The full sample includes 18.4% females, and it is predominantly white (75.3 %). Only 18.1% of officers in the sample of married at commissioning, which is expected given that the typical officer in the sample is 24.8 years old at commissioning. The percentage of officers married to another service member at any time from commissioning is 11.9%, compared with 57.6% of officers married to a civilian.

Table 14.   Variable Means (Full Sample)

Variables	Main Data Set		FITREP Data Set	
	Number of Observations	Full Sample Means	Number of Observations	Full Sample Means
Dependent Variables				
Ten Year Retention	11,198	0.753	7,350	0.862
Promoted to O4	8,035	0.843	6,157	0.879
EP Pct at 10 YOS			5,989	0.398
Independent Variables				
Demographics				
Age	16,143	24.842	8,552	25.459
Female	16,143	0.184	8,552	0.197
Male	16,143	0.816	8,552	0.803
White (Non Hisp)	16,143	0.753	8,552	0.742
Black (NonHisp)	16,143	0.071	8,552	0.084
Hispanic	16,143	0.094	8,552	0.088
Asian	16,143	0.051	8,552	0.054
Other/Unknown Race	16,143	0.032	8,552	0.032
PostGraduate Education	16,143	0.114	8,552	0.142
Marital Status				
Married at Comm.	16,143	0.181	8,552	0.214
Not Married at Comm.	16,143	0.819	8,552	0.786
Dual	16,143	0.119	8,552	0.145
Civ-Mil	16,143	0.576	8,552	0.685
Commissioning				
Naval Acadamy	16,143	0.240	8,552	0.216
ROTC	16,143	0.265	8,552	0.236
OCS/OTS/PLC	16,143	0.324	8,552	0.324
Direct	16,143	0.078	8,552	0.136
Other Commissioning	16,143	0.071	8,552	0.069
Unkn Commissioning	16,143	0.020	8,552	0.019
Navy Community				
SWO	16,143	0.233	8,552	0.219
SUB	16,143	0.098	8,552	0.102
SPEC	16,143	0.017	8,552	0.011
Aviator	16,143	0.285	8,552	0.211
RL/STAFF	16,143	0.243	8,552	0.341
Unqual. Line	16,143	0.125	8,552	0.117
Cohort				
Cohort_FY99	16,143	0.183	8,552	0.200
Cohort_FY00	16,143	0.208	8,552	0.212
Cohort_FY01	16,143	0.211	8,552	0.215
Cohort_FY02	16,143	0.206	8,552	0.192
Cohort_FY03	16,143	0.192	8,552	0.180

Table 15 shows the variable means for the dual-military marriage sample.

Table 15.   Variable Means (Dual-Military Sample)

Variables	Main Data Set		FITREP Data Set	
	Number of Observations	Dual-Military Means	Number of Observations	Dual-Military Means
Dependent Variables				
Ten Year Retention	699	0.750	491	0.845
Promoted to O4	500	0.898	402	0.928
EP Pct at 10 YOS			394	0.400
Independent Variables				
Demographics				
Age	916	24.119	568	24.648
Female	918	0.493	569	0.467
Male	918	0.507	569	0.533
White (Non Hisp)	918	0.771	569	0.764
Black (NonHisp)	918	0.058	569	0.067
Hispanic	918	0.099	569	0.102
Asian	918	0.044	569	0.042
Other/Unknown Race	918	0.028	569	0.025
PostGraduate Education	918	0.076	569	0.079
Marital Status and Dependents				
Married at Comm.	918	0.103	569	0.105
Not Married at Comm.	918	0.897	569	0.895
Married at 6 YOS	699	0.725	491	0.719
Collocation at 6 YOS	699	0.009	491	0.010
Children at 6 YOS	699	0.328	491	0.369
Married at 10 YOS	500	0.782	402	0.774
Collocation at 10 YOS	500	0.054	402	0.037
Children at 10 YOS	500	0.758	402	0.756
Commissioning				
Naval Acadamy	918	0.307	569	0.264
ROTC	918	0.271	569	0.232
OCS/OTS/PLC	918	0.214	569	0.220
Direct	918	0.129	569	0.206
Other Commissioning	918	0.062	569	0.062
Unkn Commissioning	918	0.015	569	0.016
Navy Community				
SWO	918	0.248	569	0.230
SUB	918	0.041	569	0.042
SPEC	918	0.010	569	0.005
Aviator	918	0.255	569	0.186
RL/STAFF	918	0.298	569	0.406
Unqual. Line	918	0.147	569	0.130
Cohort				
Cohort_FY99	918	0.181	569	0.206
Cohort_FY00	918	0.215	569	0.218
Cohort_FY01	918	0.224	569	0.209
Cohort_FY02	918	0.214	569	0.216
Cohort_FY03	918	0.167	569	0.151

In Table 15, average rates of promotion to O4 for officers in dual-military marriages are slightly higher than for the full sample, especially in the FITREP sample. Overall, the differences do not seem very large. These results are further examined later in this study.

Postgraduate education rates are smaller for those in a dual-military marriage (about 8% for the dual-military sample, versus 11% for the full sample).

Both datasets show the same pattern for dual-military couples over time: from commissioning to the minimum service requirement of six years, the percentage increases significantly (from 10.4 to 72%). This behavior indicates the preference to marry early in one's career and to stay in service after establishing a dual-military marriage. From six to 10 years of service, marriage rates increase only slightly (from 72 to 78%) while the number of observations drops slightly, too. This drop represents the natural decrease in personnel beyond the six- and 10-year retention marks. The relative increase of dual-military marriages may indicate a greater willingness and/or potential of dual-military couples to stay in service.

One striking finding from the mean table is the *collocation* variable, which identifies whether two officers in a dual-military marriage are stationed in the same location. In the two datasets available for this study, the percentage of dual-military couples that are in collocation is extremely low: one percent after six years and four to five percent after 10 years of service. This situation may have improved, which could be reflected with more current data, as the Department of the Navy made effort to address this issue (Bureau of Naval Personnel, 2016).

The distribution of dual-military marriages across officers from different commissioning sources shows a larger rate of dual-military marriages among the Naval academy graduates (about 29% versus 23% in the full sample).

Among Navy communities, the SUB and the RL/staff communities stand out. Dual-military marriages are fewer in the SUB community (4% in the dual-military sample, versus 10% in the full sample). Taking into account the low number of women on submarines, this low dual-military percentage appears natural. The RL and staff

communities show a higher percentage of dual-military marriages compared to the other two groups (30–40% in the dual-military sample, versus 24–34% in the full sample). This difference could indicate a better work-life balance—childcare needs and family collocation, to name a few—within these communities.

The cohort variables show that all cohorts are well distributed across the three subsamples and represent about 20% of the respective subsample.

D. DIFFERENCES IN GROUP MEANS

In this section, two sample t-tests are used to examine statistically significant differences in means between groups.

Table 16 covers the main dataset and displays the differences in 10-year retention means for MSR stayers—officers who serve beyond their minimum service requirement of six years—and in promotion to O-4 for officers who stayed to 10 years of service. Means were compared across three subsamples: dual-military marriages (dual), civilian–military marriages (civ–mil), and singles.

Table 16.   Mean Comparison of 10-Year Retention and O4-Promotion Across Marital Status Groups (Main Dataset)

Variable	Dual	Civ-Mil	T-Statistics
Ten Year Retention	0.749	0.794	2.814***
Promoted to O4	0.898	0.854	-2.675***
Variable	Dual	Single	T-Statistics
Ten Year Retention	0.750	0.550	-9.582***
Promoted to O4	0.898	0.724	-7.952***
Variable	Civ-Mil	Single	T-Statistics
Ten Year Retention	0.811	0.509	-26.079***
Promoted to O4	0.860	0.693	-11.777***

*** significant at 1%; ** significant at 5%; * significant at 10%

Table 16 shows that in the main dataset, all t-tests are statistically significant at the one-percent level.

A comparison between dual and civ-mil shows only a small difference in the Ten Year Retention rates favoring the civ-mil couples. This finding serves as the focus of further analysis in this thesis, a shown in the next chapter. That may indicate a lower likelihood for both partners to stay in the military, which lowers the burden a dual-military marriage puts on family life. However, those who stay to 10 YOS see a higher promotion rate to O-4 among dual-military couples.

Table 17 shows the same comparisons of means as Table 16, but for the FITREP dataset. In addition, table 17 shows mean comparison for one more dependent variable, EP pct at 10 YOS. This variable measures the average recommendation for early promotion among those officers who complete 10 years of service.

Table 17.　　　Mean Comparison of Dependent Variables Across Marital Status Groups (FITREP Dataset)

Variable	Dual	Civ-Mil	T-Statistics
Ten Year Retention	0.845	0.884	2.566***
Promoted to O4	0.932	0.888	-2.724***
EP_PCT_10yos	0.399	0.400	0.140
Variable	Dual	Single	T-Statistics
Ten Year Retention	0.845	0.731	-5.043***
Promoted to O4	0.932	0.807	-5.788***
EP_PCT_10yos	0.400	0.373	-2.665***
Variable	Civ-Mil	Single	T-Statistics
Ten Year Retention	0.891	0.692	-15.126***
Promoted to O4	0.892	0.787	-6.686***
EP_PCT_10yos	0.402	0.376	-3.432***

*** significant at 1%; ** significant at 5%; * significant at 10%

The results in Table 17 support the findings from Table 16 regarding 10-year retention and promotion to O-4 rates among officers in a dual-military marriage. The comparison between dual-military and civilian-military shows a small difference in the

Ten Year Retention rates favoring the civ-mil couples. Promotion to O-4 rate of officers in a dual-military marriage is higher among dual-military couples. Officers in dual-military and civilian-military marriages do not show significant differences in the EP recommendation measure. Comparing these two groups against singles, shows significant differences in all dependent variable. Ten Year Retention, Promotion to O-4 rates, and EP PCT at 10 YOS are all significantly higher for married officers—dual-military and civilian-military couples—compared to their single peers. Table 18 shows gender differences.

Table 18.   Mean Comparison of Retention, Promotion, and Early Promotion Recommendations for Male and Female Officers Within Dual-Military Marriages

Variable	Male	Female	T-Statistics
Ten Year Retention	0.903	0.771	-4.053***
Promoted to O4	0.929	0.937	0.308
EP_PCT_10yos	0.403	0.395	-0.497

*** significant at 1%; ** significant at 5%; * significant at 10%

Table 18 shows a significant difference between male and female officers with respect to 10-year retention (90.3% for male, and 77.1% for female officers), but promotion and early promotion recommendations do not show significant differences (about 93% promotion rate to O-4, and about 40% EP recommendations for both genders).

Table 19 displays t-tests for differences in the dependent variable means among officers in dual-military marriages stationed at the same location and those stationed at different locations. The average rates for all three outcome variables, Ten-year retention, Promoted to O4 and EP pct at 10YOS are statistically smaller among the group of officers in collocation with their military spouse than officers in dual-military marriage not stationed together.

Table 19.   Mean Comparison of Retention, Promotion, and Early Promotion
Recommendations for Officers in Dual-Military Marriages Stationed
Together and Apart

Variable	Collocation_10	No_Colloc_10	T-Statistics
Ten Year Retention	1.000	0.840	-1.685*
Promoted to O4	0.933	0.932	-0.016
EP_PCT_10yos	0.439	0.398	-1.0110

*** significant at 1%; ** significant at 5%; * significant at 10%

Table 20 shows differences among officers in restricted line/staff communities
and officers in unrestricted line communities living in dual-military marriages. While
promotion to O-4 appears in favor of RL/staff officers, EP recommendations are
significantly higher in URL communities.

Table 20.   Mean Comparison of Retention, Promotion, and Early Promotion
Recommendations for Officers in RL/Staff Communities vs. Officers in
URL Communities Within Dual-Military Marriages

Variable	RL/Staff	URL	T-Statistics
Ten Year Retention	0.816	0.862	1.372
Promoted to O4	0.972	0.910	-2.370**
EP_PCT_10yos	0.373	0.414	2.594***

*** significant at 1%; ** significant at 5%; * significant at 10%

E.   SUMMARY

This chapter introduces the selected datasets, comprising more than 16,000
officers and more than 8,500 officers, respectively, and the dependent and independent
variables used in this study.

Next, Chapter IV uses multivariate regression analysis to examine what factors
are most likely to explain differences in retention, promotion and EP recommendations
among officers in dual military marriage as compared with those married to a civilian or
those who are not married.

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IV.   ANALYSIS AND RESULTS

A.   METHODOLOGY

This chapter uses regression techniques to examine the relation between dual-military marriage and other factors, and the job performance of Navy officers.

When modeling 10-year retention and promotion to O-4 outcomes, which are measured by binary variables, the multivariate regressions used are probit regression models. The estimated coefficients in a standard probit regression model indicate whether the coefficient is statistically significant and its sign, not the magnitudes of these relation between the independent and dependent variable. Statistical software STATA provided the opportunity to choose a differential probit regression to show partial derivatives of each independent variable in the model, thus giving statistical significance, direction (+/-) and magnitude (marginal effects). Partial derivatives provide marginal effects of a one-unit change in a given independent variable on the outcome measured by the dependent variable (Wooldridge, 2013).

When modeling the dependent variable EP percentage at 10 YOS, which is a continuous variable an ordinary least square (OLS) estimation model is used. (Wooldridge, 2013).

B.   REGRESSION MODELS

In both, the probit and OLS estimation models, the key independent variables include marital status and gender, and the control independent variable groups include other demographics, commissioning source, Navy community, and cohort dummies. Unless stated otherwise, the control group for every model is male, single, white, no dependents, OCS, Bachelor's degree, SWO, and commissioned in cohort FY99.

1.   Ten-Year Retention

After deciding not to leave service at the minimum service requirement (MSR), an officer's next retention decision is usually made at the 10-year mark. Surely, not all officers want to stay in service, but retention at 10 years is assumed the first outcome of a

competitive board decision and, thus, can be used as suggestive of performance. The first model estimates the probability an officer decides to stay in service after this 10-year mark. Model 1 tests for any factors that could potentially influence the decision to stay as well as for factors that could lead to better performance and, consequently, to the Navy accepting the officer's request to stay in service.

Model 1 uses the main dataset. In order to allow all observations to realize all possible outcomes, the sample was restricted to those officers who stayed beyond the MSR (= "MSR stayers"). Thus, the model represents the decision to stay past MSR, at the 10-year mark and the Navy's subsequent acceptance. Figure 2 shows the model.

$$\Pr(Ten\ Year\ Retention) = 1|X) = \beta_0 + \beta_1(Demographics) + \beta_2(Marital) + \beta_3(Commissioning)$$
$$+\beta_4(Navy\ Community) + \beta_5(Cohort) + \mu$$

Figure 2. Ten-Year Retention Model (Model 1)

The demographics group consists of age, gender, race, and education. The age variable is included to capture differences in retention between those who are prior-enlisted and those who are not. Since the prior-enlisted variable was not well-populated in the dataset, age was used as a proxy instead. Female and male dummy variables were set to capture any differences between male and female officers, and to address the primary research question. Race and education variables were included to control for any effects by different race/ethnicity backgrounds. The variables in the marital group represent the focus of this study: they are meant to examine how marital status, the type of spouse (military or civilian), collocation and dependent children are related with job performance. The remaining variable groups—commissioning source, Navy community, and cohort year—were included as control variables to capture differences within these groups.

Table 21 shows the results of the 10-year retention model. The sample contains 11,168 observations due to eliminating officers who did not stay in service after six years (MSR). Table 21 displays the results for the full sample.

Table 21.   Ten-Year Retention (MSR Stayers, Full Sample)

VARIABLES	Full sample (Marginal Effects)	VARIABLES	Full sample (Marginal Effects)
Age	0.0149***	Other Commissioning	-0.0002
	(0.0017)		(0.0171)
Female	-0.0467***	Unknown Commissioning	-0.0558
	(0.0133)		(0.0384)
Black (NonHisp)	0.0202	SUB	-0.1541***
	(0.0163)		(0.0199)
Hispanic	-0.0164	SPEC	0.0189
	(0.0149)		(0.0292)
Asian	0.0085	Aviator	0.0037
	(0.0184)		(0.0119)
Other/Unkn. Race	0.0140	RL_STAFF	0.0254*
	(0.0222)		(0.0142)
Post-Graduate Education	0.0349***	Unqual_Line	-0.0096
	(0.0134)		(0.0165)
Dep. Children at 10YOS	0.2633***	Cohort_FY00	-0.0015
	(0.0082)		(0.0125)
Dual-Mil Marriage at 10YOS	0.0711***	Cohort_FY01	0.0132
	(0.0115)		(0.0127)
Civ-Mil Marriage at 10YOS	0.0506***	Cohort_FY02	0.0713***
	(0.0092)		(0.0118)
Academy	-0.0106	Cohort_FY03	0.0736***
	(0.0135)		(0.0124)
ROTC	0.0002		
	(0.0120)		
Direct	-0.0041	Observations	11,168
	(0.0200)	Mean Retention Rate	0.754

Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1

The results of Model 1 show an average ten-year retention rate of 75.4% for all MSR stayers in the sample. Female officers have a 4.7 percentage points (6.2%) lower probability of 10-year retention as compared with male officers.

Marital status variables are a particular focus of this study. The coefficients on dual-military and civilian–military marriage dummy variables are both statistically significant, showing that officers in such marriages are 7.1 percentage points (9.4%) and

5.1 percentage points (6.8%), respectively, more likely to stay in service than single (not married) officers. In this model, officers who have dependent children at 10 years of service stay in service longer, by 26.3 percentage points (34.9%), than officers with no dependent children. The coefficient on *Collocation* was not presented results; due to the small number of couples in collocation this variable had to be dropped from the estimations.

Age at commissioning has a significant and positive coefficient, showing that for each additional year, the retention increases by 1.5 percentage points (2%). Race/ ethnicity variables show only small magnitudes and are all insignificant, showing that race/ethnic groups' retention rates are no different than those of white officers. An officer who has obtained graduate education is 3.5 percentage points (4.6%) more likely to stay beyond 10 years of service than those without advanced degrees.

Differences in ten-year retention rates among officers from different commissioning sources are not statistically different. Within URL communities, only the submarine community shows strong significant, and negative, behavior. An officer in the submarine community is 15.4 percentage points (20.4%) less likely to retain beyond 10 years of service.

Among the entry cohorts, officers commissioned in 2002 and 2003 show larger ten-year retention rates compared with those commission in FY99. As Table 21 shows, both cohorts have about seven percentage points (9.3%) higher ten-year retention rates compared with officers from the fy99 cohort. One possible explanation could be the 2007–2008 Great Recession and the following decline in job opportunities outside the military, which may have made officers more likely to stay beyond their MSRs and, subsequently, to 10 years of service.

To further examine the scope to marital status factors and to measure differences in retention rates among officers married to a civilian, and officers married to a service member, the ten-year retention model was estimated within the sub-samples of officers who were married at any point from commissioning to 10 YOS, by gender. The

comparison groups now consist of white, no dependents, civilian-military marriage, OCS, Bachelor's degree, SWO, and cohort FY99. Table 22 shows the estimated coefficients.

Table 22. Ten-Year Retention (MSR Stayers, Married, by Gender)

VARIABLES	Female Married (Marginal Effects)	Male Married (Marginal Effects)	VARIABLES	Female Married (Marginal Effects)	Male Married (Marginal Effects)
Age	0.0058	0.0069***	Unknown Commissioning	-0.3209**	0.0004
	(0.0044)	(0.0017)		(0.1494)	(0.0331)
Black (NonHisp)	0.0997***	-0.0101	SUB	omitted	-0.1269***
	(0.0344)	(0.0190)			(0.0212)
Hispanic	0.0488	-0.0027	SPEC	omitted	0.0249
	(0.0406)	(0.0148)			(0.0257)
Asian	0.0421	0.0179	Aviator	-0.0371	-0.0124
	(0.0469)	(0.0186)		(0.0426)	(0.0122)
Other/Unkn. Race	0.1207***	0.0466**	RL_STAFF	-0.0099	0.0065
	(0.0459)	(0.0184)		(0.0398)	(0.0149)
Post-Graduate Education	-0.0100	0.0229*	Unqual_Line	0.0268	-0.0254
	(0.0473)	(0.0127)		(0.0478)	(0.0176)
Dep. Children at 10YOS	0.2784***	0.2972***	Cohort_FY00	0.0639*	-0.0067
	(0.0235)	(0.0092)		(0.0343)	(0.0125)
Dual-Mil Marriage at 10YOS	-0.0840***	0.0251**	Cohort_FY01	0.0248	-0.0010
	(0.0255)	(0.0124)		(0.0380)	(0.0129)
Academy	-0.0748	0.0030	Cohort_FY02	0.1191***	0.0355***
	(0.0566)	(0.0129)		(0.0317)	(0.0120)
ROTC	-0.0987**	0.0133	Cohort_FY03	0.1158***	0.0386***
	(0.0480)	(0.0112)		(0.0328)	(0.0126)
Direct	-0.0746	0.0196			
	(0.0489)	(0.0210)			
Other Commissioning	0.0109	0.0216	Observations	1,062	7,814
	(0.0612)	(0.0152)	Mean Retention Rate	0.751	0.814

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The average probability of ten-year retention rates for married female and married male officers is 75.1 and 81.4%, respectively.

The coefficients on the dual-military marriage dummy variable shows that female officers married to a military spouse are 8.4 percentage points (11.2 %) less likely to retain at the 10 year mark, as compared with the female officers married to a civilian. However, among male officers, the dual-military marital status appears to be not a penalty, but rather an advantage in terms of ten-year retention rate, as compared with the male officers married to a civilian. Male officers in a dual-military marriage, have a 2.5 percentage points (3.1%) higher retention rate than male officers in a civilian-military marriage. The small number of female officers in a civilian-military marriage might enter

a small-sample bias in the estimated coefficients; the findings need to be further validated by larger sample sizes.

Among the demographic variables, age is no longer a significant factor in predicting ten-year retention rates for married female officers, but it is for married male officers. The magnitude of age coefficient for men is rather small (0.7 percentage points increased retention rates for officers one year older).

Having dependent children by 10 years of service has a strong positive association with the 10-year retention rate for female officers (27.8 percentage points) and male officers (29.7 percentage points) in a dual-military marriage, compared to the retention rates for officers married to a civilian.

Black female officers married to a military spouse have a 9.97 percentage point higher ten-year retention compared with white female officers in a dual-military marriage. All other race variables are insignificant, for both genders.

Among Navy communities, submarine and special warfare communities are omitted from this regression due to the small number of observations. As all warfare areas have opened to women recently, newer data are expected to yield different results. All other variables show similar behavior as in the previous regression of the full sample.

2.   Promotion to O-4

Once the Navy accepts an officer to enter active service as an ensign (O-1), the next two promotions are considered "quasi-automatic" (Asch & Warner, 2005). That is, if an officer is eligible, he or she will get promoted in time. These promotions are not considered competitive as the Navy's manpower structure requires a decent number of O-2s and O-3s to populate the lower leading positions with officers possessing a necessary minimum of experience. Promotions to the rank of lieutenant commander (O-4), however, are competitive. The so-called "up or out" system requires promotions to be considered for retention.

Similar to Model 1, the sample used for estimating the promotion to O-4 models was restricted to officers who were still in service at 10 years of service because only those officers are eligible for promotion to O-4.

In Model 2, promotion to O-4 is the dependent variable, while the independent variable groups remain as in Model 1. Figure 3 shows the model.

$$\text{Pr}(Promotion\ O-4) = 1|X) = \beta_0 + \beta_1(Demographics) + \beta_2(Marital) + \beta_3(Commissioning)$$
$$+\beta_4(Navy\ Community) + \beta_5(Cohort) + \mu$$

Figure 3. Promotion to O-4 Model (Model 2)

Table 23 shows the results of the promotion model. The sample consists of 8,014 observations for the *full* sample (married and not married), and 6,838 observations for the *married* sample.

Table 23.　　　　Promotion to O-4 (10-Year Stayers, Full Sample and Married Subsample)

VARIABLES	Full Sample (Marginal Effects)	Married sample (Marginal Effects)	VARIABLES	Full Sample (Marginal Effects)	Married sample (Marginal Effects)
Age	-0.0024*	-0.0028*	Other Commissioning	-0.0422**	-0.0298
	(0.0014)	(0.0014)		(0.0182)	(0.0182)
Female	0.0103	0.0053	Unknown Commissioning	0.0010	0.0048
	(0.0121)	(0.0136)		(0.0217)	(0.0207)
Black (NonHisp)	-0.0420**	-0.0184	SUB	-0.0252	-0.0216
	(0.0164)	(0.0158)		(0.0177)	(0.0174)
Hispanic	0.0011	0.0068	SPEC	0.0590***	0.0573***
	(0.0153)	(0.0155)		(0.0198)	(0.0185)
Asian	-0.0304	-0.0301	Aviator	-0.0384***	-0.0312***
	(0.0196)	(0.0215)		(0.0116)	(0.0116)
Other/Unkn. Race	-0.0011	0.0076	RL_STAFF	0.0713***	0.0635***
	(0.0218)	(0.0212)		(0.0112)	(0.0110)
Post-Graduate Education	-0.0235*	-0.0158	Unqual_Line	0.0040	-0.0020
	(0.0125)	(0.0122)		(0.0176)	(0.0180)
Dep. Children at 10YOS	0.0308***	0.0254***	Cohort_FY00	-0.0119	-0.0151
	(0.0089)	(0.0084)		(0.0153)	(0.0156)
Dual-Mil Marriage at 10YOS	0.0516***	0.0125	Cohort_FY01	-0.0483***	-0.0403**
	(0.0108)	(0.0116)		(0.0164)	(0.0166)
Civ-Mil Marriage at 10YOS	0.0389***		Cohort_FY02	-0.1130***	-0.1007***
	(0.0101)			(0.0185)	(0.0192)
Academy	-0.0350**	-0.0276*	Cohort_FY03	-0.3886***	-0.3768***
	(0.0141)	(0.0142)		(0.0233)	(0.0258)
ROTC	-0.0414***	-0.0393***			
	(0.0127)	(0.0129)			
Direct	-0.0895***	-0.0863***	Observations	8,014	6,838
	(0.0231)	(0.0246)	Mean Promotion Rate	0.843	0.863

Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1

The average promotion probability is 84.3% for the full sample, and 86.3% for married officers. There is no significant difference in promotion rates among males and females.

Officers in dual-military and civilian-military marriage show significantly better promotion outcomes than singles, with retention rates of 5.16 percentage points (6.1%) and 3.89 percentage points (4.6%) higher promotion rates than not married officers. However, among married officers, officers in dual-military marriage show no significant difference in promotion rates compared to promotion rates for officers married to a civilian.

Having dependent children at 10 years of service is associated with a significantly higher promotion outcome—by 3.1 percentage points (3.7%) for the married officers,

compared with not married officers, and by 2.5 percentage points (3.0%) for the officers in a dual-military marriage compared with officers in a civilian-military marriage.

Among the demographic variables, only the black race variable is significant, showing that black officers are 4.2 percentage points (5.0%) less likely to promote to O-4 than white officers. All other demographic variables are insignificant in estimating promotion outcomes.

All commissioning sources show lower promotion outcomes than officer candidate school (OCS). Among Navy communities, special warfare and RS/staff communities show higher promotion outcomes than the SWO community in both the full and married samples.

While in the retention model, cohort years 2002 and 2003 showed positive coefficients, promotion outcomes were negatively associated with commissioning cohort years 2001, 2002, and 2003. The Great Recession, with shifted retention behavior, could be the reason; more officers wanted to stay in service during that time. Thus, the pool of eligible officer may have increased, and subsequently, promotion rates decreased. This effect can be found in both, the full and the married, samples.

The promotion outcomes are further examined for the subsamples for married female and male officers. Table 24 shows the estimated coefficients of these models. The samples were restricted to those who stayed at least until the 10-year mark. The comparison group consists of white officers, with no dependents, in civilian-military marriages, with OCS, Bachelor's degree, in the SWO community, and commissioned in FY99. The number of observations for the married male subsample is 6,082; for married females, the subsample is only 731.

Table 24.   Promotion to O-4 (10-Year Stayers, Female Married and Male Married Subsamples)

VARIABLES	Female Married (Marginal Effects)	Male Married (Marginal Effects)	VARIABLES	Female Married (Marginal Effects)	Male Married (Marginal Effects)
Age	-0.0098***	-0.0009	Unknown Commissioning	0.0144	0.0054
	(0.0034)	(0.0016)		(0.0599)	(0.0216)
Black (NonHisp)	-0.0277	-0.0138	SUB	omitted	-0.0149
	(0.0330)	(0.0174)			(0.0173)
Hispanic	0.0320	0.0024	SPEC	-0.2194	0.0633***
	(0.0325)	(0.0171)		(0.3080)	(0.0178)
Asian	0.0057	-0.0372	Aviator	-0.1395**	-0.0223*
	(0.0446)	(0.0239)		(0.0545)	(0.0120)
Other/Unkn. Race	omitted	-0.0067	RL_STAFF	0.0668*	0.0625***
		(0.0242)		(0.0342)	(0.0116)
Post-Graduate Education	0.0062	-0.0197	Unqual_Line	0.0273	-0.0063
	(0.0316)	(0.0131)		(0.0443)	(0.0193)
Dep. Children at 10YOS	0.0260	0.0244***	Cohort_FY00	0.0636**	-0.0285
	(0.0222)	(0.0090)		(0.0285)	(0.0174)
Dual-Mil Marriage at 10YOS	0.0015	0.0172	Cohort_FY01	-0.0360	-0.0390**
	(0.0212)	(0.0134)		(0.0412)	(0.0179)
Academy	-0.0905	-0.0163	Cohort_FY02	-0.0167	-0.1143***
	(0.0608)	(0.0144)		(0.0398)	(0.0212)
ROTC	-0.0992**	-0.0306**	Cohort_FY03	-0.1470**	-0.4102***
	(0.0482)	(0.0133)		(0.0609)	(0.0277)
Direct	-0.0510	-0.1181***			
	(0.0452)	(0.0307)			
Other Commissioning	-0.0238	-0.0297	Observations	731	6,082
	(0.0504)	(0.0195)	Mean Promotion Rate	0.880	0.860

Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1

The mean promotion rate for the female married subsample is 88%; for the male married subsample, it is 86%. Because officers who stay beyond 10 years of service are reviewed for promotion to O-4, these high rates are not surprising.

Among married officers, those in a dual-military marriage have no different promotion rates as compared to those in a civilian-military marriage. In the marital variables group, dependent children at 10 YOS were significant for married men. Married men who have children at 10 YOS are 2.4 percentage points (2.8%) more likely to promote to O-4 than those without dependent children.

All demographic variables show no significance regarding promotion outcomes.

The coefficients show significantly lower promotion outcomes with ROTC-commissioned officers for both subsamples (10 and 3.1 percentage points, respectively), compared to officers commissioned through OCS. Among Navy communities, men in dual-military marriage are more likely to promote in the special warfare (6.3 percentage

points) and RL/staff communities (6.3 percentage points) compared with men in civilian-military marriage. However, they are less likely to promote in the aviator community compared to the SWO community. Similarly, women in dual-military marriage are more likely to promote in the RL/staff communities (6.7 percentage points, 7.6%) but less likely in the aviator community (14.0 percentage points, 15.9%) compared with women in civilian-military marriage. Officers commissioned in cohort year 2003 show significantly lower promotion rates for both subsamples (14.7 and 41.0 percentage points, respectively) compared with the officers commissioned in fiscal year 1999.

The low number of observations may affect the reliability of this model, particularly for the female married subsample. Results, however, are in line with findings form earlier research by Maugeri (2016).

3. Early Promotion Recommendation

As discussed in Chapter II, various FITREP scores are recorded. Among the variables, the EP recommendation is considered the most unbiased performance score in the Navy's current fitness reporting system (Mehay, 2005).

FITREP data are available for a subset of the full data. In this section, the *EP Pct to 10 YOS* model results are presented. As in Model 2, the sample for this model was restricted to officers who stayed at least until the 10-year mark. The sample contains 5,978 observations and follows the same independent variable groups. The percentage of EP recommendations, *EP pct to 10 YOS*, is the dependent variable is a continuous variable; therefore, this model uses an OLS regression instead of a probit regression utilized for the previous binary variables. Figure 4 shows the *EP Pct to 10 YOS* estimates.

$$E(Early\ Promotion\ Recommendation\ Percentage)|X) = \beta_0 + \beta_1(Demographics)$$
$$+\beta_2(Marital) + \beta_3(Commissioning) + \beta_4(Navy\ Community) + \beta_5(Cohort) + \mu$$

Figure 4. Early Promotion Recommendation Model (Model 3)

In Model 3, the same independent variable groups as in Models 1 and 2 were used.. The comparison groups consisted of male, white, no dependents, single, OCS, Bachelor's degree, SWO, and cohort FY99, unless stated otherwise.

Table 25 shows the results of the EP recommendation model. The average promotion probability is 39.8% for the full sample (married and not married officers).

Table 25.   Early Promotion Recommendation Percentage
(10-Year Stayers, Full Sample)

VARIABLES	Full sample (Marginal Effects)	VARIABLES	Full sample (Marginal Effects)
Age	-0.0019***	Other Commissioning	-0.0219***
	(0.0007)		(0.0082)
Female	-0.0269***	Unknown Commissioning	-0.0390**
	(0.0063)		(0.0153)
Black (NonHisp)	-0.0015	SUB	0.0715***
	(0.0072)		(0.0078)
Hispanic	0.0116	SPEC	0.0494***
	(0.0073)		(0.0175)
Asian	-0.0156*	Aviator	0.0043
	(0.0089)		(0.0061)
Other/Unkn. Race	-0.0097	RL_STAFF	0.0360***
	(0.0112)		(0.0063)
Post-Graduate Education	0.0183***	Unqual_Line	0.0060
	(0.0058)		(0.0085)
Dep. Children at 10YOS	-0.0095**	Cohort_FY00	-0.0050
	(0.0047)		(0.0062)
Dual-Mil Marriage at 10YOS	0.0163**	Cohort_FY01	-0.0103
	(0.0073)		(0.0063)
Civ-Mil Marriage at 10YOS	0.0082	Cohort_FY02	-0.0166**
	(0.0054)		(0.0066)
Academy	-0.0168**	Cohort_FY03	-0.0261***
	(0.0070)		(0.0072)
ROTC	-0.0223***	Constant	0.4556***
	(0.0060)		(0.0198)
Direct	-0.0658***		
	(0.0077)	Observations	5,978

Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1

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Female officers show a significantly lower percentage of EP recommendations, by 2.69 percent, compared with male officers.

Officers in a dual-military marriage are 1.63 percent more likely to receive a higher percentage of EP recommendations, compared with single officers.

Among demographic variables, age, and graduate education have significant coefficients. Age is negatively related to EP recommendations; however, with 0.2%, the magnitude is rather small. Postgraduate education increases the percentage of EP recommendation rate by 1.8 percentage.

Having dependent children is associated with a slightly decreased percentage of EP recommendations, by 0.9 percent. Interestingly, being in a dual-military marriage increase the probability of receiving a recommendation by 1.6% compared to those not married, while those in a civilian-military marriage have no differences in EP recommendation rates as compared with single officers. While Models 1 and 2 had the same significance and same direction for the dependent children coefficients in the full sample, the dependent children coefficient in Model 3 is the first indication of a difference between dual-military and civilian-military marriages and is further examined in the next run of this model with different subsamples.

Table 26 shows the results of the EP recommendation model limited to the sample of all married officers, and including an interaction term for female officers in dual-military marriages.

Table 26.   Early Promotion Recommendation Percentage
(10-Year Stayers, Pooled Married Sample)

VARIABLES	Full sample (Marginal Effects)
Female	-0.0484***
	(0.0097)
Dual-Mil Marriage at 10YOS	-0.0032
	(0.0076)
Female in Dual-Military	0.0427***
	(0.0137)
Constant	0.4602***
	(0.0211)
All other control variables included, but not shown	
Observations	5,216
R-squared	0.0446

Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1

Including an interaction term between dual-military and female in the *EP Pct to 10 YOS* model estimated for the married officers sample, showed a significant and positive coefficient on the interaction term. Thus, female officers in dual-military marriages show a higher EP recommendation rate than their male counterparts.

All included commissioning sources show significantly lower EP recommendation rates than for officers commissioning from OCS. The following Navy communities show significantly higher outcomes than the SWO community: submarine (7.2%), special warfare (4.9%), and RL/staff (3.6%). The magnitudes of these coefficients leave the SWO community with a considerably lower chance of getting EP recommendations. Only the coefficient on aviators is not significant, confirming the findings of Models 1 and 2, and sharing the lower recommendation rate with SWOs. The cohort coefficients also confirm findings from Models 1 and 2. Cohort years 2002 and 2003 show significantly lower recommendation rates, by 1.7% and 2.6%, respectively, as compared with cohort 1999.

For more specific differences by marital status, the sample was restricted to female and male married officers, and both subsamples estimated by gender. Table 26 shows the results of these regressions.

The mean EP recommendation rates were 37% for the female married subset, and 40.7% for the male married subset. The female married sample contains 632 observations and the male married sample has 4,584 observations.

Table 27 show the EP recommendation model for the married female and married male subsamples.

Table 27.　　　Early Promotion Recommendation Percentage (10-Year Stayers, Female Married and Male Married Subsamples)

VARIABLES	Female Married (Marginal Effects)	Male Married (Marginal Effects)	VARIABLES	Female Married (Marginal Effects)	Male Married (Marginal Effects)
Age	-0.0030	-0.0019**	Unknown Comm.	-0.0798	-0.0184
	(0.0020)	(0.0008)		(0.0578)	(0.0169)
Black (NonHisp)	-0.0038	-0.0009	SUB	omitted	0.0749***
	(0.0182)	(0.0087)			(0.0083)
Hispanic	0.0191	0.0110	SPEC	-0.0449	0.0545***
	(0.0243)	(0.0083)		(0.1675)	(0.0178)
Asian	-0.0260	-0.0083	Aviator	0.0275	0.0049
	(0.0289)	(0.0111)		(0.0275)	(0.0066)
Other/Unkn. Race	0.0226	-0.0135	RL_STAFF	-0.0042	0.0433***
	(0.0349)	(0.0126)		(0.0199)	(0.0071)
Post-Graduate Education	0.0163	0.0181***	Unqual_Line	0.0527	0.0023
	(0.0204)	(0.0063)		(0.0338)	(0.0093)
Dep. Children at 10YOS	-0.0137	-0.0037	Cohort_FY00	0.0146	-0.0083
	(0.0144)	(0.0048)		(0.0207)	(0.0068)
Dual-Mil Marriage at 10YOS	0.0293**	-0.0073	Cohort_FY01	0.0190	-0.0143**
	(0.0135)	(0.0079)		(0.0215)	(0.0070)
Academy	-0.0731**	-0.0083	Cohort_FY02	-0.0073	-0.0146**
	(0.0302)	(0.0077)		(0.0221)	(0.0073)
ROTC	-0.0713***	-0.0134**	Cohort_FY03	0.0279	-0.0303***
	(0.0219)	(0.0066)		(0.0239)	(0.0080)
Direct	-0.1205***	-0.0401***	Constant	0.4884***	0.4539***
	(0.0205)	(0.0095)		(0.0585)	(0.0227)
Other Commissioning	-0.0685**	-0.0113			
	(0.0276)	(0.0091)	Observations	632	4,584

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The marital status variable group yields interesting results. Unlike the results in Models 1 and 2, the coefficient on dependent children at 10 YOS is insignificant for both samples, married females and married males. Here, children are not a marker for EP recommendation outcomes of married officers. Being in a dual-military marriage improves the EP recommendation rate of female married officers by 2.9% over female officers in civilian-military marriages. Male officers in dual-military marriage have no different rates of EP recommendations when compared with male officers in civilian-military marriage. Female officers appear to benefit in some way by being in a dual-

military marriage. Reasons for this somewhat counterintuitive result are unknown, and worthy of further study. Potential reasons accounting for such a finding are manifold. Following a traditional family view, responsibility for childcare and other family concerns usually lies with the mother. Thus, for men, it might make little difference whether the wives are working in the military or in a civilian job. For women, however, having a more "understanding" spouse, may positively change the quality of life, allow a greater focus on job responsibilities, and subsequently improve job performance. Other reasons could be subconscious career competition with their military spouse, willful support of the wife's career progress by the husband, or a sort of selection bias when male and female service members consider becoming a couple.

Demographic variables in these models show insignificant coefficients of race/ ethnicity variables. Holding everything else constant, officers with postgraduate education have increased recommendation rates, by 1.8% among male officers married to a military spouse compared to male officers married to a civilian spouse. In the female married subsample, the magnitude of postgraduate education is the same, but the coefficient is insignificant, probably because the small sample size could not establish significance.

Further coefficients for commissioning source, Navy community, and cohort follow patterns similar to those in Models 1 and 2. Included commissioning sources show lower recommendation rates compared to the excluded OCS commissioning. As in the full sample, the following communities are significantly higher for married male officers: submarine (7.5%), special warfare (5.5%), and RL/staff (4.3%). For married female officers, all Navy communities are insignificant. The same effects were found for the cohort variable group; cohort years 2001 (1.4%), 2002 (1.5%), and 2003 (3.0%) were significantly lower for men while insignificant for women. These insignificant findings, again, could be a result of the small sample size for female married officers (n = 632).

V.   CONCLUSIONS AND RECOMMENDATIONS

A.   CONCLUSIONS

The Navy initiated a set of talent-management actions to recruit, train, and retain talented personnel and to maintain a diverse force (Department of the Navy, 2015). The Navy's leadership is particularly interested in better understanding how to identify talent and how high-quality personnel make labor-supply decisions. Understanding job performance is crucial in managing high-quality personnel, supporting these individuals, retaining them, and eventually promoting them to senior leadership positions.

After the Military Leadership Diversity Commission (MLDC) found in 2011 that women were underrepresented in senior leadership positions and faced lower promotion rates, the military services increased their efforts to achieve gender equality and equity. Subsequent research validated lower retention rates among female Navy officers (Mundell, 2016). Identifying, explaining, and addressing causal factors for gender differences in promotion and retention are difficult tasks at best and the focus of continuing research. The present study attempts to contribute to this growing base of information and understanding.

In 2005, Mehay and Bowman examined the connection between performance and marital status. The authors found significantly higher performance ratings among married men compared to single men in the military. When examining the SWO community, Kraus et al. (2013) supported these findings by showing significantly higher retention among married men with children, but they did not find a similar correlation for married female SWOs. Asch et al. (2012) also substantiated the finding of lower promotion and retention rates for female officers.

Since Mundell (2016) had previously examined female officer retention decisions, the present study sought to investigate the performance aspect, particularly within a dual-military marriage. As stated above, it was hypothesized initially that the retention and job performance of female officers in a dual-military marriage would differ significantly from that of officers in the comparison groups. These differences were expected due to

the increased demands of military service likely experienced by dual-military couples, and particularly among wives who might have more competing family responsibilities. The present study employed three different models to explore this hypothesis and determine the correlation between productivity and dual-military marriages.

The 10-year retention model supports previous research findings, showing lower retention rates among female service members. Dual-military marriage status is associated with higher retention among male, but not among female officers. At the same time, this finding does not answer the question of whether lower performance leads to lower retention.

The second model, using promotion to O-4 as one possible performance indicator, does not find significant effects of dual-military marriages when compared with civilian-military marriages. This result may suggest that promotion to O-4 is not influenced to any greater degree, positively or negatively, by being in either a dual-military or civilian-military marriage. An alternative explanation is that Navy policies are effective in neutralizing dual-military issues or stressors that could affect an officer's chances for promotion to O-4.

The third model relies on a FITREP dataset and is meant to examine performance as captured in Navy FITREPs. Previous research suggests that a recommendation for early promotion (EP) is the most unbiased indicator of a member's performance. Since this variable was available in the FITREP dataset, it was used to create the EP recommendation model. The model shows significantly higher percentage of EP recommendation for officers in a dual-military marriage compared with single officers, and for female officers in a dual-military marriage compared with female officers in a civilian-military marriage. In contrast, male officers in a dual-military marriage show no significant difference in EP recommendation rates when compared with those of male officers married to a civilian spouse. A possible explanation for this gender difference could be better intra-family support for the serving woman.

Data analysis suggests that women in a dual-military marriage exhibit higher performance when compared with their male counterparts. Female officers show a lower

percentage of EP recommendations compared with male officers. However, among the married officers, female officers in dual-military marriage show a higher percent of EP recommendations than males in dual-military marriage. Due to the small sample size, these findings will have to be validated in future research, using large data sets.

Having dependent children and working in a RL/staff community, which is usually viewed as having better work-life balance, likely are not associated with differences in performance, as measured by EP recommendations. In addition to dual-military marriages, commissioning source is the only other variable found to relate significantly with performance. Officers commissioned through officer candidate school (OCS) receive the best average performance scores. This finding cannot be explained with the data used for the present study. However, it should be noted that the magnitude of difference is small across all commissioning sources. Further research could help to determine whether there is an actual impact of commissioning source on an officer's job performance and what might explain the observed relationship.

Based on earlier research, restricted line and staff communities were expected to show higher retention rates and performance because of better quality of life, higher motivation, and better performance. This expectation was confirmed for the full sample models but did not show significance among dual-military married officers. The SWO community shows the lowest performance outcomes on average across all communities in this study. Submarine and special warfare communities show some significance but still have inherent power issues because women were not allowed in these communities until recently. Future research with more recent data may provide better insight into the dynamics of performance outcomes within these communities. From these data, community does not play a role in estimating the actual performance of a Navy officer.

As a general remark, limiting the sample of 16,143 officer observations to married women leaves the researcher with small sample sizes. While still being able to establish statistical significance and draw conclusions, results in the present study may look different from those using another dataset.

B.   LIMITATIONS AND RECOMMENDATIONS

One of the limitations of this study stems from possible endogeneity caused by a correlation between the variables of 10-year retention and promotion to O-4. Both happen in the same period of an officer's career. Therefore, decisions for both are made nearly at the same time, and the perceived chance of being promoted may influence an officer's retention decision. To address this issue, research could be conducted using different models to further detail or narrow down factors for retention decisions.

Data clearly indicate a higher retention potential among married service members. The same holds true on average for service members in a dual-military marriage. Navy policies that incentivize marriages and support married personnel are assumed appropriate for increasing retention rates. Gender differences within dual-military marriages exist but are not related to performance. Additional performance modeling suggests significantly higher performance among married women in a dual-military marriage when compared with that of their male counterparts. Thus, policies that foster dual-military marriages may be suitable for increasing female officer performance—and, subsequently, the retention and promotion of this group—without affecting significantly the performance of male officers.

Another limitation is the small sample size of female married officers. In recent years, the Navy has opened more and more communities to women, so more recent data could result in bigger samples and more resilient results. Findings in this thesis are statistically significant, but further research should be conducted to support these findings before planning or establishing policies as previously mentioned.

One other factor tested in this study was collocation, that is, when both partners in a dual-military marriage are assigned to the same duty-station or to different duty-stations close to each other. Such a constellation helps reduce weekly commuting and provides the opportunity for both partners to be with the family frequently. However, the present study finds no impact of collocation on performance indicators—apparently dual-military couples find ways to address issues without being at the same location and without having an impact on job performance. Another reason for not finding effects may be the

extremely small number of actual collocation data. Further research with better data could look more thoroughly into the stationing of dual-military couples while controlling for external factors.

As discussed in Chapter II, dual-military marriages are prone to face family shocks, such as deployments or parents stationed in different geographical locations, more often than civilian-military marriages. To retain quality personnel from dual-military marriages, the Navy needs to make sure that these family shocks do not occur considerably more often than in civilian-military marriages. For example, coordination of projected rotation dates for both partners in conjunction with the aforementioned collocation policy (NAVPERSCOM, 2015) could reduce stress caused by families not living in the same location.

In summary, the present study suggests that female Navy officers in a dual-military marriage are significantly less likely, on average, than officers in several comparison groups to stay in the Navy during the first ten years. The reasons for these comparatively lower retention rates are unclear. At the same time, evidence suggests that female Navy officers in a dual-military marriage who remain in the Navy are not hindered generally from performing at least as well as, or even higher than, their male counterparts—tending to merit promotion at a rate similar to or exceeding that of their peers. To achieve gender equality, the Navy needs to ensure that talented female officers are willing and able to stay in service. Clearly, retention is the first prerequisite for officers, regardless of gender or marital status, to perform well later in their careers.

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